ROSS®
ISO VALVES
&
SERIAL BUS
INSTALLATION GUIDES

Installation Service Instructions

Important User Information

Safety Guidelines

Warning

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Consider it DONE!

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Installation & Service Instructions
A10330

W66 Size 0 & W66 Size 00
ISO 15407-1
Subbase & Manifold Assembly

ISSUED: August, 2007
Supersedes: None

⚠ WARNING

To avoid unpredictable system behavior that can cause personal injury and property damage:

- **Disconnect electrical supply (when necessary) before installation, servicing, or conversion.**
- **Disconnect air supply and depressurize all air lines connected to this product before installation, servicing, or conversion.**
- **Operate within the manufacturer's specified pressure, temperature, and other conditions listed in these instructions.**
- **Medium must be moisture-free if ambient temperature is below freezing.**
- **Service according to procedures listed in these instructions.**
- **Installation, service, and conversion of these products must be performed by knowledgeable personnel who understand how pneumatic products are to be applied.**
- **After installation, servicing, or conversion, air and electrical supplies (when necessary) should be connected and the product tested for proper function and leakage. If audible leakage is present, or the product does not operate properly, do not put into use.**
- **Warnings and specifications on the product should not be covered by paint, etc. If masking is not possible, contact your local representative for replacement labels.**

Safety Guide

For more complete information on recommended application guidelines, see the Installation Safety Guidelines section of Bulletin 600 (Form A10309) or you can download the Installation Safety Guidelines at: www.rosscontrols.com/rosslit.htm.

⚠ WARNING

FAILURE OR IMPROPER SELECTION OR IMPROPER USE OF THE PRODUCTS AND/OR SYSTEMS DESCRIBED HEREIN OR RELATED ITEMS CAN CAUSE DEATH, PERSONAL INJURY AND PROPERTY DAMAGE.

This document and other information from ROSS CONTROLS, its subsidiaries and authorized distributors provide product and/or system options for further investigation by users having technical expertise. It is important that you analyze all aspects of your application, including consequences of any failure and review the information concerning the product or systems in the current product catalog. Due to the variety of operating conditions and applications for these products or systems, the user, through its own analysis and testing, is solely responsible for making the final selection of the products and systems and assuring that all performance, safety and warning requirements of the application are met.

The products described herein, including without limitation, product features, specifications, designs, availability and pricing, are subject to change by ROSS CONTROLS and its subsidiaries at any time without notice.

EXTRA COPIES OF THESE INSTRUCTIONS ARE AVAILABLE FOR INCLUSION IN EQUIPMENT / MAINTENANCE MANUALS THAT UTILIZE THESE PRODUCTS. CONTACT YOUR LOCAL REPRESENTATIVE.

⚠ WARNING

Air exhausting from one valve into the exhaust gallery of the manifold assembly may momentarily pressurize other valve circuits open to the same gallery. Design the circuit such that there is no hazard or consequence of damage from this action.

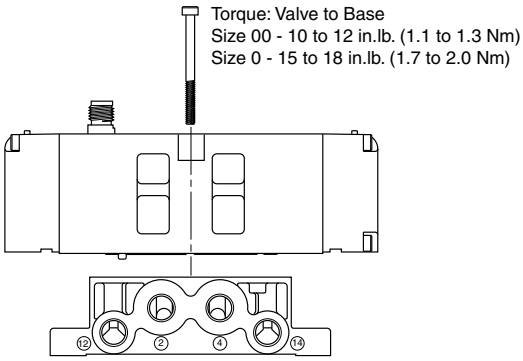
Introduction

Follow these instructions when installing, operating, or servicing the product.

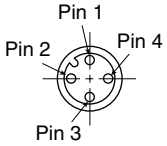
Application Limits

These products are intended for use in general purpose compressed air systems only. Compliance with the rated pressure, temperature, and voltage is necessary - see Installation & Service Instructions packed with valve.

Subbase Assembly



Wiring - ISO 20401



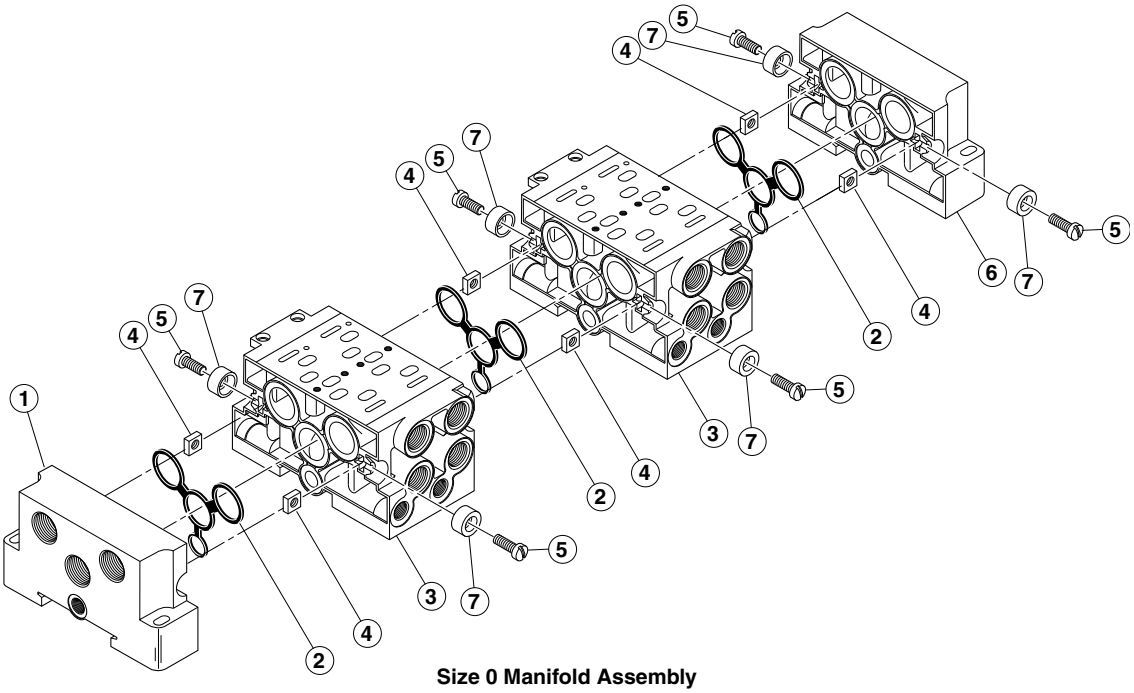
4-Pin M12

Wiring Type	ISO
Pin #1	N/A
Pin #2	12
Pin #3	Com
Pin #4	14

Service Kits

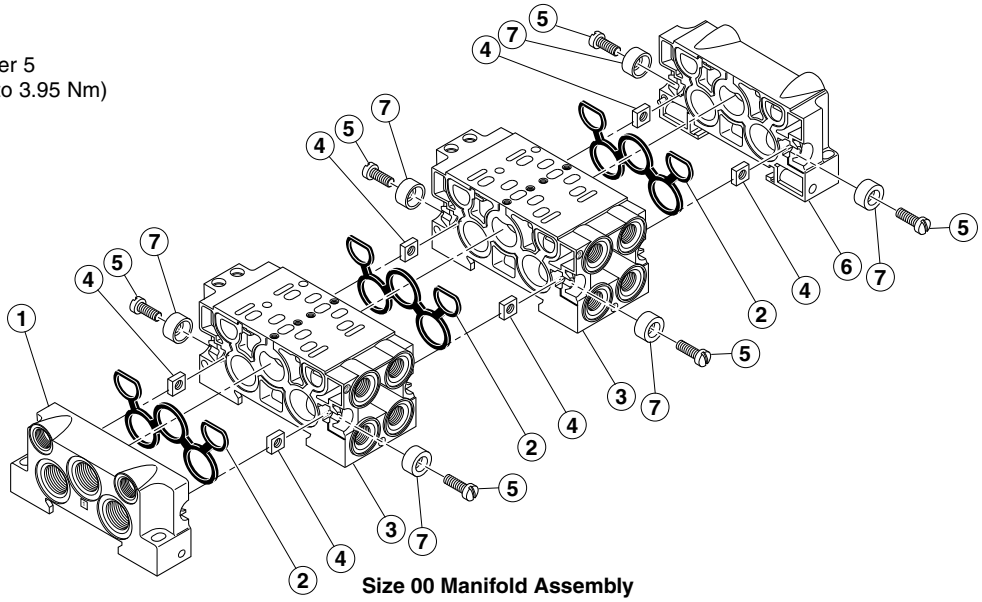
Kit Number	Description	Items Included (Qty)
RPEJ02-02-80	18mm End Plate Kit, 1/4" NPT	1 (1), 2 (1), 4 (2) 5 (2), 6 (1), 7 (2)
RPEJ02-02-70	18mm End Plate Kit, 1/4" BSPP	
RPEJ01-03-80	26mm End Plate Kit, 3/8" NPT	
RPEJ01-03-70	26mm End Plate Kit, 3/8" BSPP	
RD02P-01-80	18mm Intermediate Air Supply Base Kit, 1/8" NPT	Not Shown
RD01P-02-80	26mm Intermediate Air Supply Base Kit, 1/4" NPT	Not Shown
RD02BD0	18mm Manifold Port Isolation Disc Kit	Not Shown (3 per Kit)
RD01BD0	26mm Manifold Port Isolation Disc Kit	Not Shown (3 per Kit)
RDX02BLK	18mm Blanking Plate Kit	Not Shown
RDX01BLK	26mm Blanking Plate Kit	Not Shown
RDX02M2MB*	Manifold to Manifold Bolt Kit	4 (10), 5 (10), 7 (10)
RDX02M2MGSKT	02 Manifold to Manifold Gasket Kit	
RDX01M2MGSKT	01 Manifold to Manifold Gasket Kit	

* Use this Number for both sizes, RPJLP02 & RPJLP01.



Size 0 Manifold Assembly

Torque - Item Number 5
25 to 35 in-lb (2.82 to 3.95 Nm)



Size 00 Manifold Assembly

Manifold to Manifold Assembly

1. Lay Right End Plate (when looking at Cylinder Ports) Port Side down.
2. Place Gasket in gasket track and Retaining Nut in slot.
3. Place Manifold on top and tighten using Screw and Washer (both sides).
4. Repeat Steps 2 and 3 until all manifold slices are assembled.
5. Attach Left End Plate.
6. Lay Manifold on flat surface and check for straightness. Tighten all bolts per torque specifications.

Item Number	Description
1	Left End Plate
2	Gasket
3	Manifold
4	Retaining Nut
5	Screw
6	Right End Plate
7	Washer

For all Instruction Sheets, go to www.rosscontrols.com

A10326 - W66 Size 0 (26mm) & W66 Size 00 (18mm) ISO 15407 Valve Service
A10327 - W66 Size 0 & W66 Size 00 ISO 15407-2 Interposed Flow Controls
A10329 - W66 Size 0 & W66 Size 00 Interposed Regulators
A10330 - W66 Size 0 & W66 Size 00 ISO 15407-1 Subbbase & Manifold Installation
A10331 - W65 Size 1, 2 & 3, ISO 5599-1, 5599-2 Subbase & Manifold Installation

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Installation & Service Instructions
A10326

Size 0 (26mm) & Size 00 (18mm)
ISO 15407 Valve Service

ISSUED: June, 2013
Supersedes: August, 2007 issue

ALERT:
Remove Control 12 & 14 Pipe Plugs in Subbase or Manifold Before Installing Valve.

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Introduction

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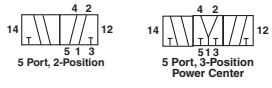
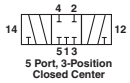
Port Identification / Connections / Symbols

Port No.	Single Pressure	Dual Pressure
1	Inlet	Exhaust
2	Outlet	Outlet
3	Exhaust	Inlet
4	Outlet	Outlet
5	Exhaust	Inlet
12, 14	Pilot ports for External Pilot or Remote Pilot	

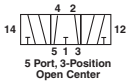


5 Port, 2-Position

5 Port, 3-Position Power Center



5 Port, 3-Position Closed Center



5 Port, 3-Position Open Center

Valves may be used for single outlet (3-Way) by plugging an outlet Port.

NOTE: The operator identification describes the ports that are connected when the operator is energized: operator 12 connects Port 1 to Port 2; operator 14 connects Port 1 to Port 4. Other ports may also be connected, or blocked – see symbols on the valve.

⚠ **CAUTION: It is recommended that double solenoid and double remote air pilot operated 2-Position valves be mounted so that the axis of the valve spool is in the horizontal plane.**

Lubrication

Factory Pre-lubed. If lubricating in service, use paraffin based mineral oil with 150 to 200 SSU viscosity @100°F.

⚠ **CAUTION: Do not use oils that are synthetic, reconstituted, have an alcohol content or a detergent additive.**

Application Limits

These products are intended for use in general purpose compressed air systems only.

Operating Pressure Range:

Maximum: 145 PSIG (1000 kPa)
Minimum: See Chart

Internal Pilot	Min. PSIG (kPa) Size 0	Min. PSIG (kPa) Size 00
Single Solenoid - 2-Position	25 (173)	25 (173)
Double Solenoid- 2-Position		
Single Remote - 2-Position	Vacuum	Vacuum
Double Remote Pilot - 2-Position	Vacuum	Vacuum
Double Solenoid - 3-Position	35 (241)	35 (241)
Double Remote Pilot - 3-Position	Vacuum	Vacuum
Single Solenoid - 2-Position Air Return / Spring Assist	30 (207	30 (207)
Single Remote Pilot - 2-Position Air Return / Spring Assist		
External Pilot*		
Size 0 & Size 00 Series	Vacuum	Vacuum

* External Pilot Pressure / Remote Pilot Signal - 45 to 145 PSIG (310 to 1000 kPa).

Ambient Temperature Range: -15°C to 49°C (5°F to 120°F)

Voltage Range: Rated Voltage +10%, -15%

⚠ **CAUTION: Solenoid versions of this valve contain solid state components that can be damaged by transient voltage spikes, over-voltage or high temperature. To protect against premature solenoid failure, please read and adhere to the following:**

If this solenoid operated valve is used in a circuit with other inductive loads, the solenoid should be electrically protected with a voltage suppression device (e.g. transient voltage suppressor or varistor) that has a minimum rating of 1.6 times the rated voltage of the solenoid valve and sufficient capacity to dissipate the energy of other inductive loads.

⚠ **CAUTION: Solenoid versions of this valve are to be earth grounded through the direct metal to metal contact of the valve body to an appropriately grounded metal mounting surface.**

Servicing Valve Body

Refer to Figures 1 and 2 to aid with disassembly and reassembly.

1. Remove Valve from base by removing Body to Base Screws (20).
2. For ISO 15407-2: Remove Connector (14) by carefully gripping the pins with a needle nose pliers and pull to remove.

   For ISO 15407-1: Go directly to Step 3.
3. Remove each End Cap (13 / 17 / 18) by removing the Screws (16).
4. Remove the Pistons (9 or 10), Spool Return Spring (22), if applicable, and the Spool (3, 5, 6 or 7), **being careful not to scratch the valve body bore.**
5. Using a clean, lint free cloth, clean sealing surfaces.
6. Apply a light coating of grease to each part noted in Figure 1 and the mating sealing surface of each of these parts.
7. Reassemble valve in reverse order of disassembly, replacing the necessary parts. Care must be taken when reassembling the End Caps. **Install Item 14 Connector after Item 13 Operator End Cap is installed on the Body. Note pin kink orientation in Figure 1.**
8. Install Base Gasket (19) onto pin on bottom of valve. For Internal Pilot Pressure, be sure the letters "I" are visible. For External Pilot Pressure, be sure the letters "X" are visible. See the valve to base gasket drawings below.

Note: After servicing the valve in any way, apply pressure to the valve and check for leaks. If any leak exists, repeat assembly process and retest until valve is leak free.

Item	Description	Item	Description
1	Body, Single Solenoid	13	Solenoid Operator End Cap
2	Body, Double Solenoid	14	Connector
3	Spool - 2-Position (Seals Assembled)	15	O-Ring
4	Seal - Spool	16	Screws, Operator to Body
5	Spool - 3-Position CC (Seals Assembled)	17	Return Operator End Cap, Single Solenoid
6	Spool - 3-Position OC (Seals Assembled)	18	Return Operator End Cap, Double Solenoid
7	Spool - 3-Position PC (Seals Assembled)	19	Body to Base Gasket
8	Seal, Operator Piston	20	Screws, Body to Base
9	Operator Piston, 2-Position	21	Connector, 2-Pin
10	Operator Piston, 3-Position	22	Spool Return Spring
11	End Cap Gasket	23	M12 Insert Assembly
12	Solenoid / Circuit Board Assy	24	O-Ring

Ⓛ Lightly grease with provided lubricant.

✓ Inspect for nicks, scratches, and surface imperfections. If present, reduced service life is probable and future replacement should be planned.

Ⓒ Clean with lint-free cloth.

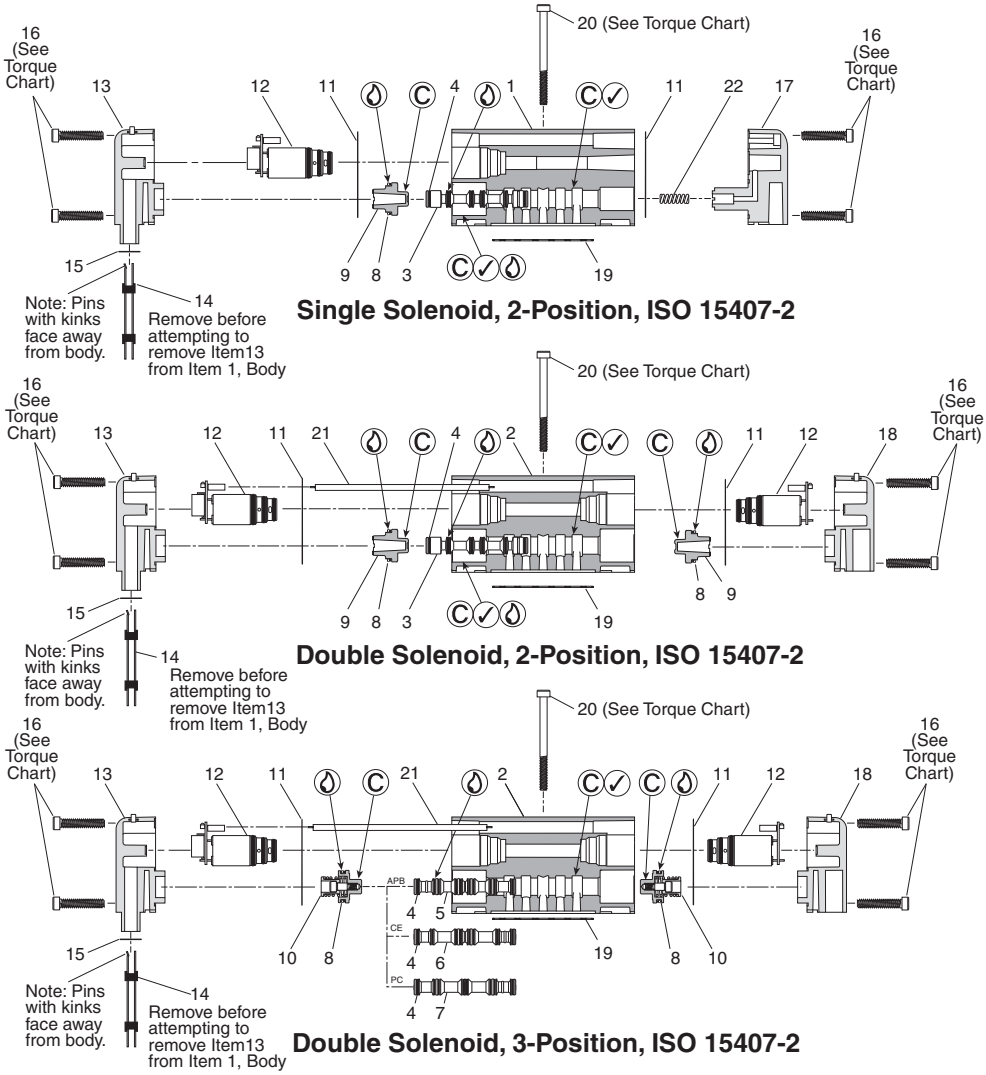

16 (See Torque Chart)
20 (See Torque Chart)
Note: Pins with kinks face away from body.
Remove before attempting to remove Item13 from Item 1, Body
Single Solenoid, 2-Position, ISO 15407-2
Double Solenoid, 2-Position, ISO 15407-2
Double Solenoid, 3-Position, ISO 15407-2

Figure 1

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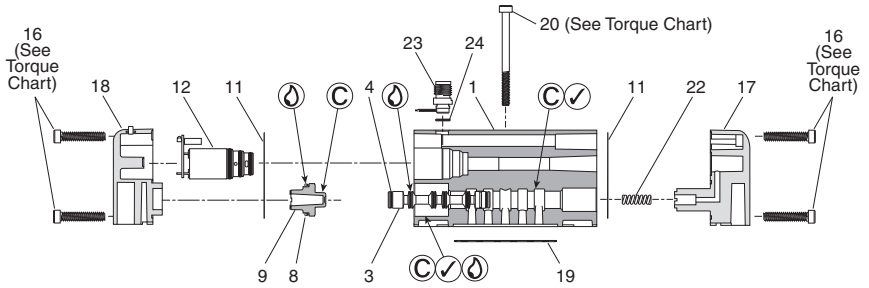
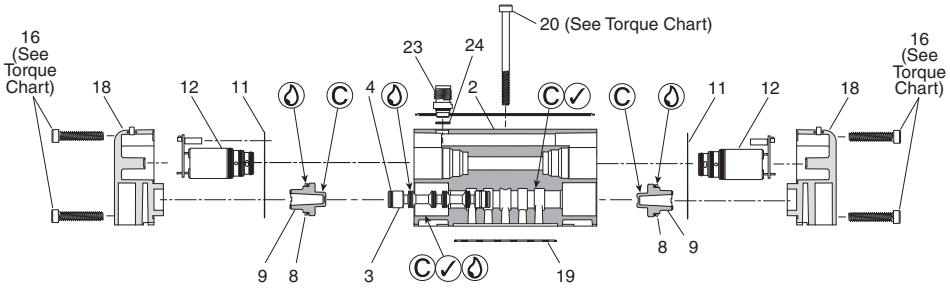
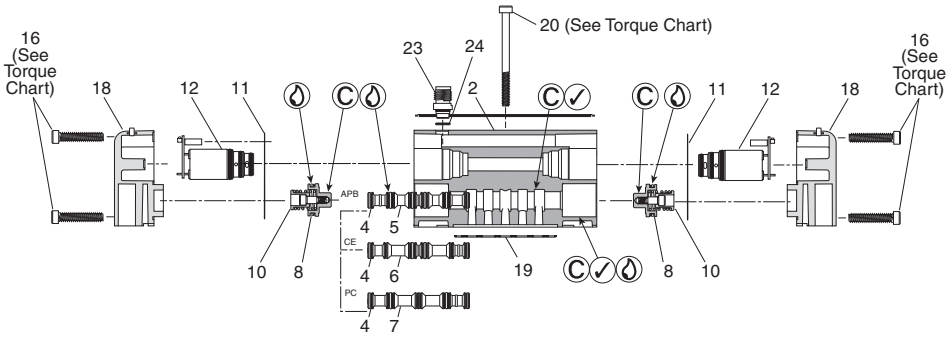


Single Solenoid, ISO 15407-1



Double Solenoid, ISO 15407-1



Double Solenoid, 3-Position, ISO 15407-1

Figure 2

Body Service Kits

Valve	Kit Number	Description	Kit Includes (Qty)
Size 0	RPS5501P	2-Position	All parts below plus
Size 00	RPS5601P	Body Service Kit	Return Spring (1)
Size 0	RPS5502P	3-Position CC	
Size 00	RPS5602P	Body Service Kit	Spool (1)
Size 0	RPS5503P	3-Position OC	Piston Assembly (2)
Size 00	RPS5603P	Body Service Kit	Grease Tube (1)
Size 0	RPS5504P	3-Position PC	
Size 00	RPS5604P	Body Service Kit	

Accessory Kits

Valve	Kit Number	Description	(Qty)
Size 0	RPS5587P	Valve Bolt Kit	12
Size 00	RPS5687P		
Size 0	RPS5505P	Body to Base Gasket Kit – Standard	5
Size 00	RPS5605P		

Valve Mounting Torque Specifications (Item 20)

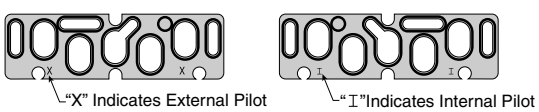
Valve to Base	W66 Size 0	W66 Size 00
Torque - in.lb. (Nm)	15 to 18 (1.7 to 2.0)	10 to 12 (1.1 to 1.3)

Operator Cap to Body Torque Specifications (Item 16)

Cap to Body	W66 Size 0 / W66 Size 00
Torque - in.lb. (Nm)	5 to 7 (.6 to .80)

Valve to Base Gaskets

Size	Part Number
Size 0	RPS5605P
Size 00	RPS5505P



"X" Indicates External Pilot "I" Indicates Internal Pilot

Remote Pilot Block Installation

⚠ Warning:

Not following instruction may result in Remote Pilot Block damage or inadequate thread engagement, which may lead to personal injury, property damage, or economic loss.

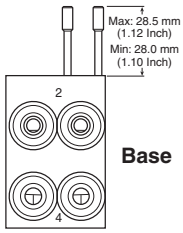
Important:

- **Remove pressure and electrical connections before installation.**
- **All threads on tie rods and screws must be free of rust, water or other debris, which could prevent finger thread engagement.**

Step 1: Install Tie Rods

1. Install two Tie Rods (3) to the base, torque finger tight.
2. Adjust tie rod height to 28.5 / 28.0 mm (1.12 / 1.10 inch) as figure shows.
3. If finger tight height exceeds 28.5 mm (1.12 inch), use mechanical tightening as necessary to get the proper height.

Note: "Base" could be a manifold, sub-base or sandwich flow control.



Step 2: Install Remote Pilot Block

1. Lay the Pilot Block Gasket (2) on the Base. Make sure the two rubber projections are face up and the orientation of the gasket is correct.
2. Engage both Tie Rods (3) into mounting holes on the Remote Pilot Block.
3. Carefully engage the Plug into the Base.
4. Continue to lower the Pilot Block Body by carefully engaging the two rubber projections on the gasket into the appropriate holes on the Pilot Block Body.
5. Press the Pilot Block Body by hand firmly. To confirm the gasket is indeed attached to the Pilot Block Body, lift the Body by about one half inch. Both rubber projections should remain in the holes.
6. Lay the Pilot Block Body back on the Base.

Step 3: Install Valve

1. Locate Valve Gasket (4) on bottom of Valve.
2. Install valve onto Pilot Block Body.
3. Carefully engage the Valve Plug.
4. Using hex wrench, tighten two Screws (5) – torque 1.5 to 1.7 Nm (13 to 15 in-lb) for W66 Size 0, 0.9 to 1.1 Nm (8 to 10 in-lb) for W66 Size 00.

Step 4: Leakage Check

1. Apply pressure to base and check for audible leakage at various joints. If any are present, do not not operate the valve, repeat the assembly procedure until satisfied.

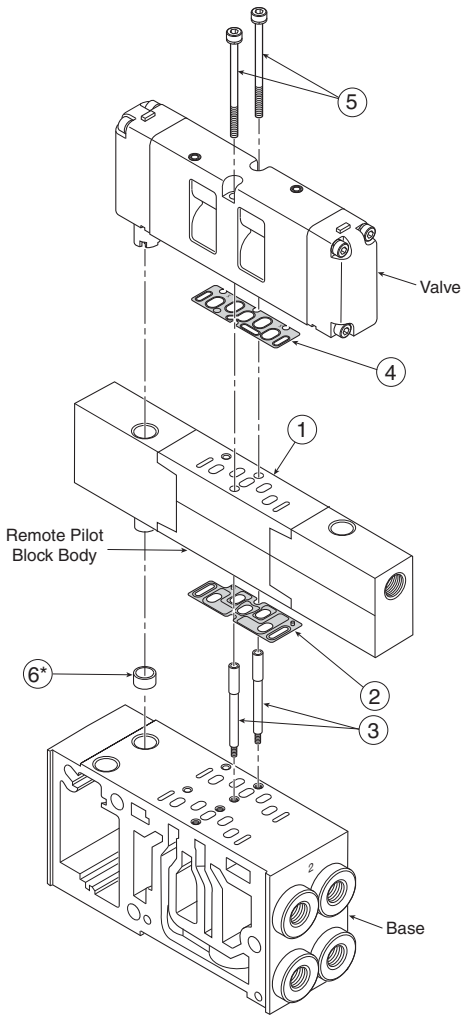


Figure 3
ISO 15407-2 Size 00 Pilot Block Body Shown
(Valve & Base shown for reference only)

Component List

The components listed below are for identification purposes only, some of these components are available in various Sandwich Regulator Kits, some are not available due to special factory assembly. Individual components are not sold separately since all kit components should be installed when serviced.

Item	Description
1	Remote Pilot Block Body
2	Pilot Block Gasket
3	Tie Rods
4	Valve Gasket
5	Mounting Screws
6	Protective Cap*

*Install Item 6, Protective Cap, in manifold over electrical plug if servicing manifold assembly with valve or remote pilot block removed and power is on. Remove cap before re-installing valve or remote pilot block.

For all Instruction Sheets, go to www.rosscontrols.com

A10326 - W66 Size 0 (26mm) & W66 Size 00 (18mm) ISO 15407 Valve Service
A10327 - W66 Size 0 & W66 Size 00 ISO 15407-2 Interposed Flow Controls
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A10331 - W65 Size 1, 2 & 3, ISO 5599-1, 5599-2 Subbase & Manifold Installation

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Installation & Service Instructions A10321

Serial Bus 24 VDC Analog Input Modules, Series A (RPSSNACM12A, RPSSNAVM12A)

ISSUED: August, 2007
Supersedes: None

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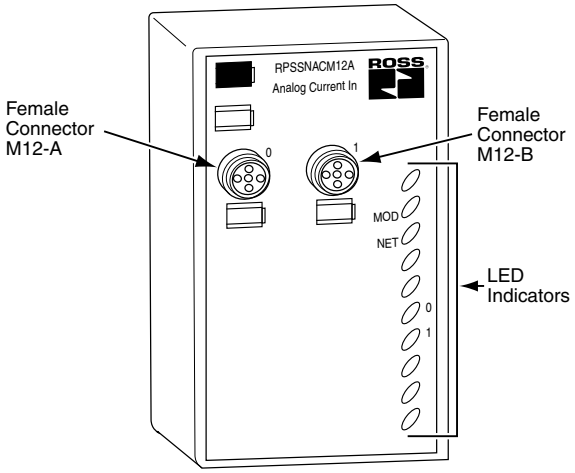
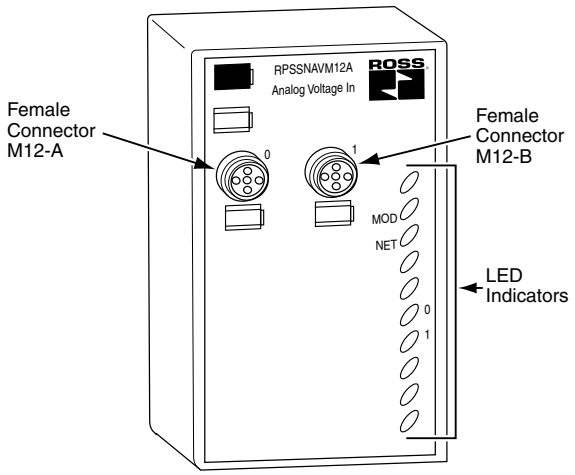
RPSSNACM12A



RPSSNAVM12A



Introduction

Follow these instructions when installing, operating, or servicing the product.

Serial Bus 24 VDC Analog Input Modules, Series A

(RPSSNACM12A, RPSSNAVM12A)

The sealed IP67 housing of these modules requires no enclosure. (Note that environmental requirements other than IP67 may require an additional appropriate housing.) I/O connectors are sealed M12 style. The mounting base ships with the module. The RPSSNACM12A and RPSSNAVM12A modules are shown below.

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This document and other information from ROSS CONTROLS, its subsidiaries and authorized distributors provide product and/or system options for further investigation by users having technical expertise. It is important that you analyze all aspects of your application, including consequences of any failure and review the information concerning the product or systems in the current product catalog. Due to the variety of operating conditions and applications for these products or systems, the user, through its own analysis and testing, is solely responsible for making the final selection of the products and systems and assuring that all performance, safety and warning requirements of the application are met.

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IMPORTANT	Identifies information that is critical for successful application and understanding of the product.
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SHOCK HAZARD	Labels may be located on or inside the equipment to alert people that dangerous voltage may be present.
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Mount the I/O Base

To mount the I/O base on a wall or panel, use the screw holes provided in the base.

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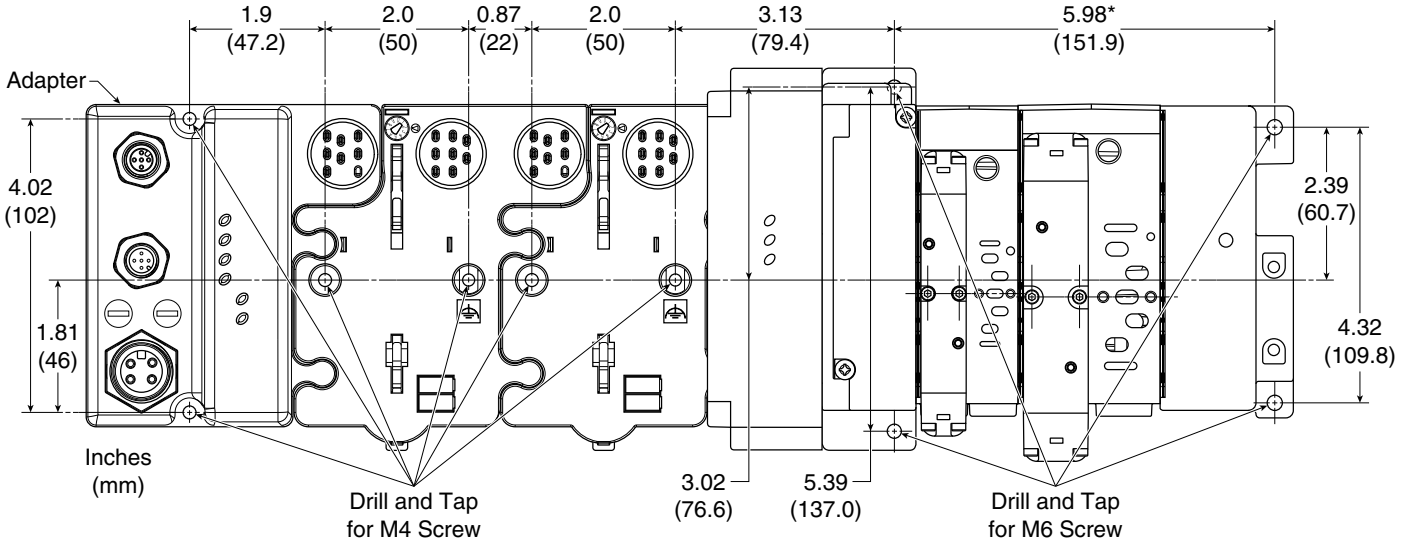
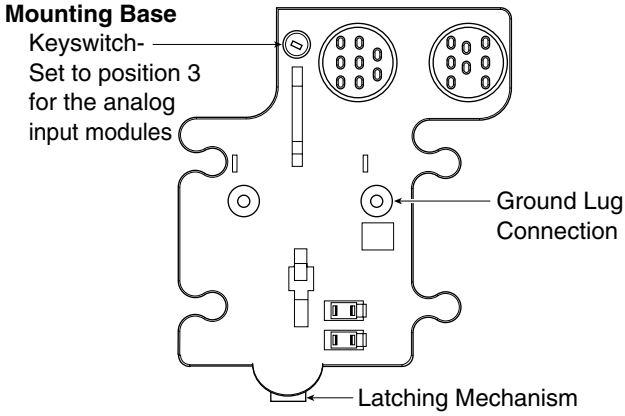
A mounting illustration for the base with an adapter is shown below.



*Depending on the type and number of manifolds, this dimension may vary. Consult Ross for specific information.

Install the Mounting Base as Follows:

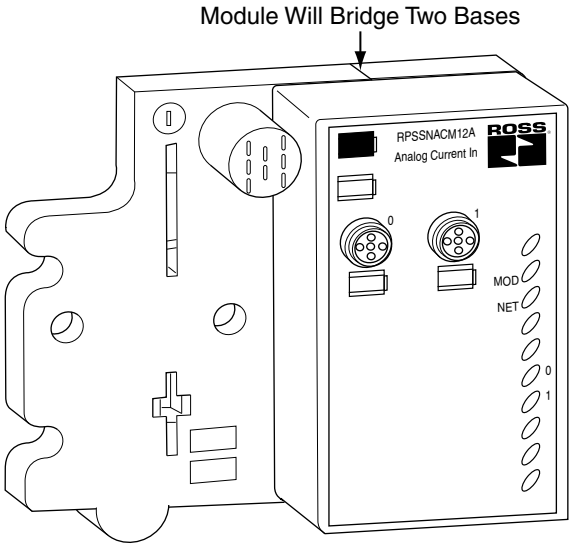
1. Lay out the required points as shown above in the drilling dimension drawing.
2. Drill the necessary holes for #8 (M4) machine or self-tapping screws.
3. Mount the base using #8 (M4) screws.
4. Ground the system using the ground lug connection. (The ground lug connection is also a mounting hole.)



Install the Analog Input Module

To Install the Analog Input Module, Proceed as Follows:

1. Using a bladed screwdriver, rotate the keyswitch on the mounting base clockwise until the number 3 aligns with the notch in the base.
2. Position the module vertically above the mounting base. The module will bridge two bases.



3. Push the module down until it engages the latching mechanism. You will hear a clicking sound when the module is properly engaged.

The locking mechanism will lock the module to the base.

Remove the Analog Input Module From the Mounting Base

To Remove the Module from the Mounting Base:

1. Put a flat blade screwdriver into the slot of the orange latching mechanism.
2. Push the screwdriver toward the I/O module to disengage the latch. The module will lift up off the base.
3. Pull the module off of the base.

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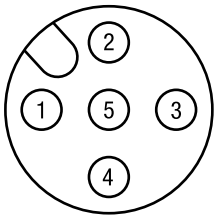
Wire the Analog Input Modules

Following are wiring instructions for the analog input modules.

RPSSNACM12A and RPSSNAVM12A



(view into connector)

Pin 1 - 24VDC

Pin 2 - Input 0 (M12-A)
Input 1 (M12-B)

Pin 3 - Common

Pin 4 - Common

Pin 5 - No Connect

IMPORTANT

Analog modules have earth grounded metal rings. This should be considered when choosing shielded cables and grounding techniques.

ATTENTION

Make sure all connectors and caps are securely tightened to properly seal the connections against leaks and maintain IP67 requirements.

Communicate With Your Module

I/O messages are sent to (consumed) and received from (produced) the I/O modules. These messages are mapped into the processor's memory. These I/O analog input modules produce 6 bytes of input data (scanner Rx) and fault status data. They do not consume I/O data (scanner Tx).

Default Data Map for the Analog Input Modules

RPSSNACM12A and RPSSNAVM12A

Message Size: 6 Bytes

	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Produces (Scanner Rx)	Input Channel 0 High Byte								Input Channel 0 Low Byte							
	Input Channel 1 High Byte								Input Channel 1 Low Byte							
	Status Byte for Channel 1								Status Byte for Channel 0							
	OR	UR	HHA	LLA	HA	LA	CM	CF	OR	UR	HHA	LLA	HA	LA	CM	CF
Consumes (scanner Tx)	No consumed data															

Where: CF = Channel Fault Status, 0 = no error, 1 = fault
CM = Calibration Mode; 0 = normal, 1 = calibration mode
LA = Low Alarm; 0 = no error, 1 = fault
HA = High Alarm; 0 = no error, 1 = fault
LLA = Low/Low Alarm; 0 = no error, 1 = fault
HHA = High/High Alarm; 0 = no error, 1 = fault
UR = Underrange; 0 = no error; 1 = fault
OR = Overrange; 0 = no error; 1 = fault

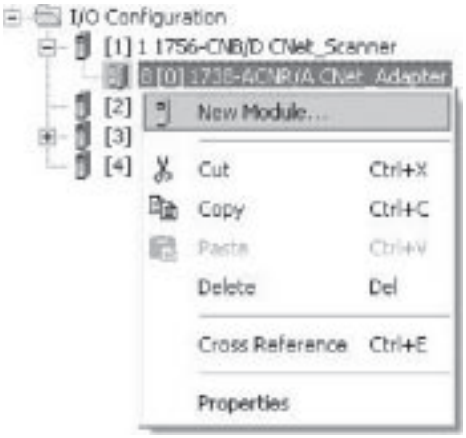
EDS File Requirements

The EDS files are available online at:
www.rosscontrols.com/rosslit.htm

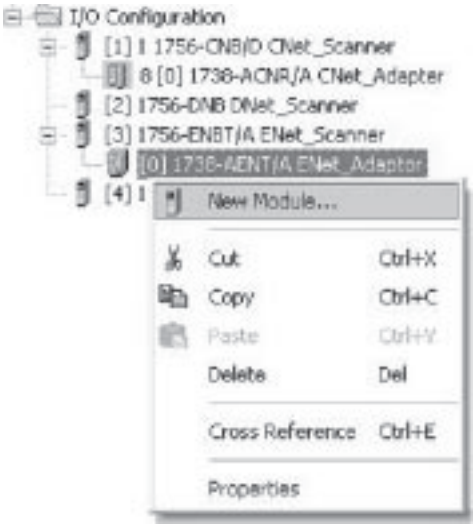
Add Analog Input Modules to RSLogix 5000 I/O Configuration

To add your analog input modules to RSLogix 5000 I/O configuration, follow these steps:

- In RSLogix 5000:
  - For ControlNet, highlight the ***RPSSCCNA*** or ***1738-ACNR Shown)***, right click and select ***New Module***.

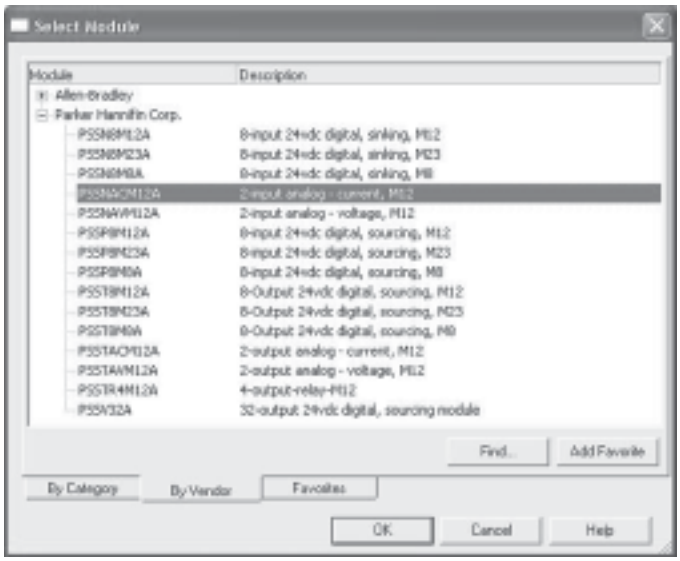


  - For EtherNet/IP, highlight the ***RPSSCENA*** or***1738-AENT (Shown)***, right click and select ***New Module***.

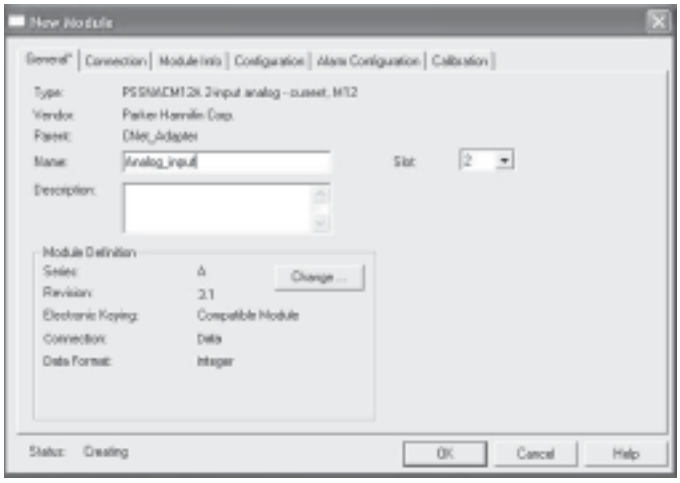


If your RSLogic 5000 is Version 15.X or greater:

- Choose the ***RPSSNACM12A*** module from the list of Parker modules.



- Enter a name and click OK.



- Notice that the RPSSNACM12A is now under the I/O configuration.

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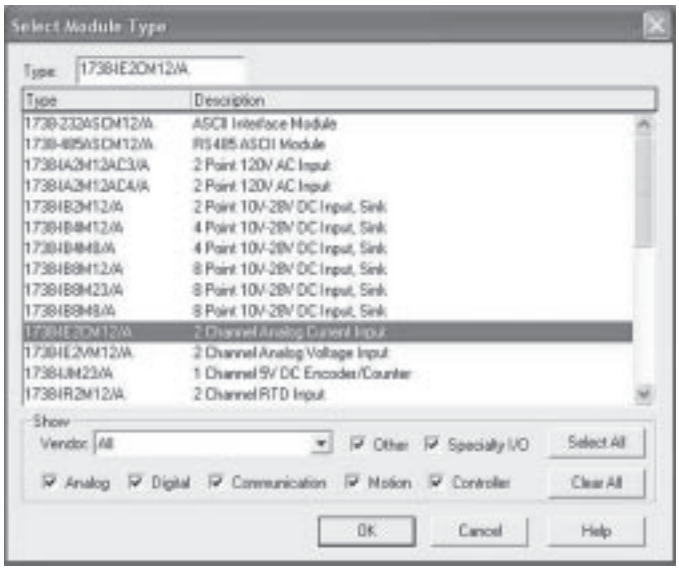
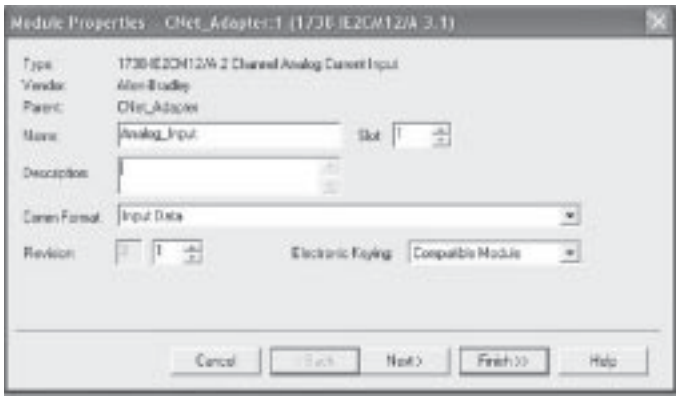
If your RSLogic 5000 is Version 13.X:

- Choose the equivalent Rockwell Automation module from the list of modules.



Serial Bus Modules	Equivalent Rockwell Automation 1738 ArmorPoint Modules
RPSSNACM12A	1738-IE2CM12
RPSSNAVM12A	1738-IE2VM12

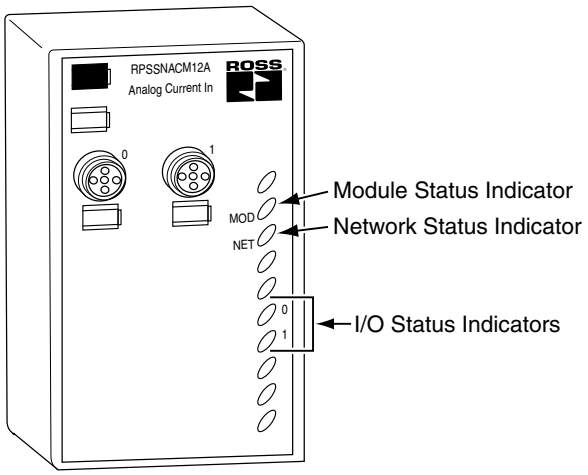
- Enter a name (optional), slot number, and comm. format. Make sure to choose ***Compatible Module for Electronic Keying*** setting.



- Choose ***Next*** to set **RPI.**
- Choose ***Finish***. Notice that the analog input module is now under the I/O configuration

Troubleshoot With the Indicators

RPSSNACM12A



Indication	Probable Cause
Module Status	
Off	No power applied to device
Green	Device operating normally
Flashing Green	Device needs commissioning due to missing, incomplete, or incorrect configuration
Flashing Red	Recoverable fault
Red	Unrecoverable fault - may require device replacement
Flashing Red/Green	Device is in self-test

Indication	Probable Cause
Network Status	
Off	Device is not on line: - Device has not completed dup_MAC-id test. - Device not powered - check module status indicator.
Flashing Green	Device is on line but has no connections in the established state.
Green	Device is on line and has connections in the established state.
Flashing Red	One or more I/O connections in timed-out state.
Red	Critical link failure - failed communication device. Device detected error that prevents it from communicating on the network.
Flashing Red/Green	Communication faulted device - the device has detected a network access error and is in communication faulted state. Device has received and accepted an Identity Communication Faulted Request - long protocol message.

Indication	Probable Cause
I/O Status	
Off	Module in CAL mode
Solid Green	Normal (channel scanning inputs)
Flashing Green	Channel being calibrated
Solid Red	No power or major channel fault
Flashing Red	Channel at end of range (over or under)

Specifications - Following are specifications for the RPSSNACM12A and RPSSNAVM12A analog input modules.

Analog Input Modules	
Inputs per Module	2 single ended, nonisolated
Input Voltage	RPSSNAVM12A only 0-10V (user configurable) (-0.0V under, +0.5V over) ±10V (user configurable) (-0.5V under, +0.5V over)
Input Current	RPSSNACM12A only 4-20 mA 0-20 mA
Input Impedance	RPSSNACM12A - 60Ω RPSSNAVM12A - 100kΩ
Resolution	RPSSNACM12A - 16 bits - over 0-21 mA; 0.32µA/cnt RPSSNAVM12A - 15 bits plus sign; 320µV/cnt in unipolar or bipolar mode
Absolute Accuracy[1]	0.1% Full Scale @ 25°C
Accuracy Drift w/Temp.	RPSSNACM12A - 30ppm/°C RPSSNAVM12A - 5ppm/°C
Input Update Rate (per module)	100 ms @ Notch = 60 Hz (default) 120 ms @ Notch = 50 Hz 24 ms @ Notch = 250 Hz 12 ms @ Notch = 500 Hz
Step Response (per module)	70 ms @ Notch = 60 Hz (default) 80 ms @ Notch = 50 Hz 16 ms @ Notch = 250 Hz 8 ms @ Notch = 500 Hz
Digital Filter Time Constant	0-10,000 ms (default = 0 ms)
Input Resistance	RPSSNAVM12A only 200kΩ
Conversion Type	Delta Sigma
Common Mode Rejection Ratio	120 dB
Normal Mode Rejection Ratio	-60 dB -3 dB Notch filter 15.7 Hz @ Notch = 60 Hz 13.1 Hz @ Notch = 50 Hz 65.5 Hz @ Notch = 250 Hz 131 Hz @ Notch = 500 Hz
Data Format	Signed integer
General Specifications	
Maximum Overload	Fault protected to 28.8VDC
Calibration	Factory calibrated
Indicators	1 green/red module status indicator, logic side 1 green/red network status indicator, logic side 2 green/red input status indicators, logic side
Keyswitch Position	3
PointBus Current	75 mA @ 5VDC
Power Dissipation	RPSSNACM12A - 0.6W @ 28.8VDC RPSSNAVM12A - 0.75W @ 28.8VDC
Thermal Dissipation, Maximum	RPSSNACM12A - 2.0 BTU/hr. @ 28.8VDC RPSSNAVM12A - 2.5 BTU/hr. @ 28.8VDC
Isolation Voltage (continuous voltage withstand rating)	50V rms Tested at 1250VAC rms for 60s
External DC Power Supply Voltage Voltage Range Supply Current	 24VDC nominal 10-28.8VDC RPSSNACM12A - 10 mA @ 24VDC; RPSSNAVM12A - 15 mA @ 24VDC
Dimensions Imperial (Metric)	1.25H x 2.63W x 4.25D (31.75H x 66.80W x 107.95D)
Operating Temperature	IEC 60068-2-1 (Test Ad, Operating Cold), IEC 60068-2-2 (Test Bd, Operating Dry Heat), IEC 60068-2-14 (Test Nb, Operating Thermal Shock): -20 to 60°C (-4 to 140°F)
Storage Temperature	IEC 60068-2-1 (Test Ab, Un-packaged Non-operating Cold), IEC 60068-2-2 (Test Bb, Un-packaged Non-operating Dry Heat), -40 to 85°C (-40 to 185°F)
Relative Humidity	IEC 60068-2-30 (Test Db, Un-packaged Non-operating Damp Heat): 5 to 95% non-condensing
Shock	IEC60068-2-27 (Test Ea, Unpackaged Shock): Operating 30g Non-operating 50g
Vibration	IEC60068-2-6 (Test Fc, Operating): 5g @ 10 to 500Hz
ESD Immunity	IEC 61000-4-2: 6kV contact discharges, 8kV air discharges
Radiated RF Immunity	IEC 61000-4-3: 10V/m with 1kHz sine-wave 80%AM from 30MHz to 2000MHz 10V/m with 200Hz 50% Pulse 100%AM at 900Mhz 10V/m with 200Hz 50% Pulse 100%AM at 1890Mhz
EFT/B Immunity	IEC 61000-4-4: ±3kV at 5kHz on signal ports
Surge Transient Immunity	IEC 61000-4-5: ±2kV line-earth(CM) on shielded ports
Conducted RF Immunity	IEC 61000-4-6: 10Vrms with 1kHz sine-wave 80%AM from 150kHz to 80MHz
Emissions	CSPR 11: Group 1, Class A
Enclosure Type Rating	Meets IP65/66/67 (when marked)
Mounting Base Screw Torque	#8 screw, 7.5 in. lbs. in Aluminum, 16 in. lbs. in Steel
Wiring Category[2]	1 - on signal ports
Weight Imperial (Metric)	0.637 lb. (0.289 kg)
Certifications: (when product is marked)	c-UL-us UL Listed Industrial Control Equipment, certified for US and Canada CE European Union 89/336/EEC EMC Directive, compliant with: EN 61000-6-4; Industrial Emissions EN 50082-2; Industrial Immunity EN 61326; Meas./Control/Lab., Industrial Requirements EN 61000-6-2; Industrial Immunity C- Tick Australian Radiocommunications Act, compliant with: AS/NZS CISPR 11; Industrial Emissions

1. Includes offset, gain, non-linearity and repeatability error terms.
2. Use this Conductor Category information for planning conductor routing. Refer to Publication A10324, “Industrial Automation Wiring and Grounding Guidelines”.

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Installation & Service Instructions A10322

Serial Bus 24 VDC Analog Output Modules, Series A (RPSSTACM12A, RPSSTAVM12A)

ISSUED: August, 2007
Supersedes: None

⚠ WARNING

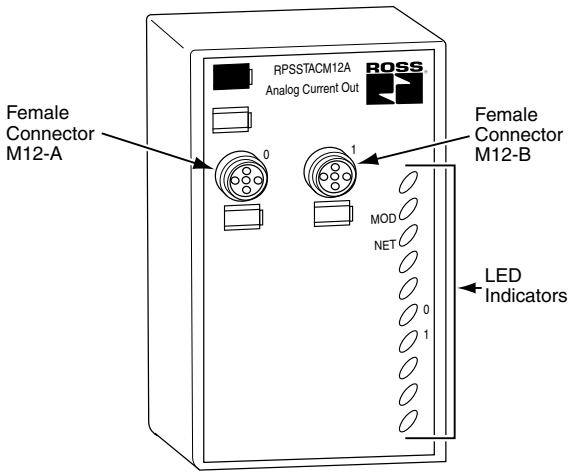
To avoid unpredictable system behavior that can cause personal injury and property damage:

- **Disconnect electrical supply (when necessary) before installation, servicing, or conversion.**
- **Disconnect air supply and depressurize all air lines connected to this product before installation, servicing, or conversion.**
- **Operate within the manufacturer's specified pressure, temperature, and other conditions listed in these instructions.**
- **Medium must be moisture-free if ambient temperature is below freezing.**
- **Service according to procedures listed in these instructions.**
- **Installation, service, and conversion of these products must be performed by knowledgeable personnel who understand how pneumatic products are to be applied.**
- **After installation, servicing, or conversion, air and electrical supplies (when necessary) should be connected and the product tested for proper function and leakage. If audible leakage is present, or the product does not operate properly, do not put into use.**
- **Warnings and specifications on the product should not be covered by paint, etc. If masking is not possible, contact your local representative for replacement labels.**

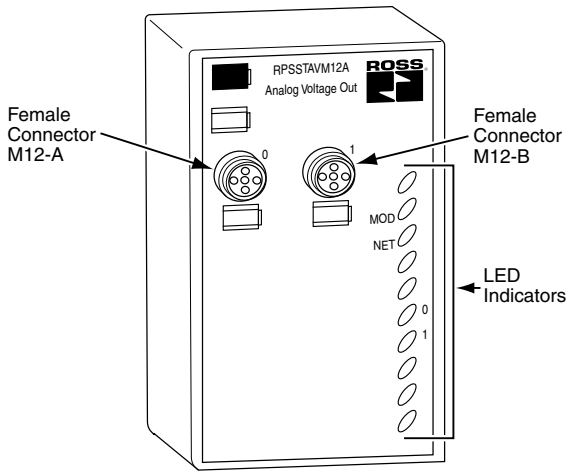
Safety Guide

For more complete information on recommended application guidelines, see the Installation Safety Guidelines section of Bulletin 600 (Form A10309) or you can download the Installation Safety Guidelines at: www.rosscontrols.com/rosslit.htm.

RPSSTACM12A



RPSSTAVM12A



Introduction

Follow these instructions when installing, operating, or servicing the product.

Serial Bus 24 VDC Analog Output Modules, Series A

(RPSSTACM12A, RPSSTAVM12A)

The sealed IP67 housing of these modules requires no enclosure. (Note that environmental requirements other than IP67 may require an additional appropriate housing.) I/O connectors are sealed M12 style. The mounting base ships with the module. The RPSSTACM12A and RPSSTAVM12A modules are shown below.

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- Wear an approved grounding wrist strap.
- Do not touch connectors or pins on component boards.
- Do not touch circuit components inside the equipment.
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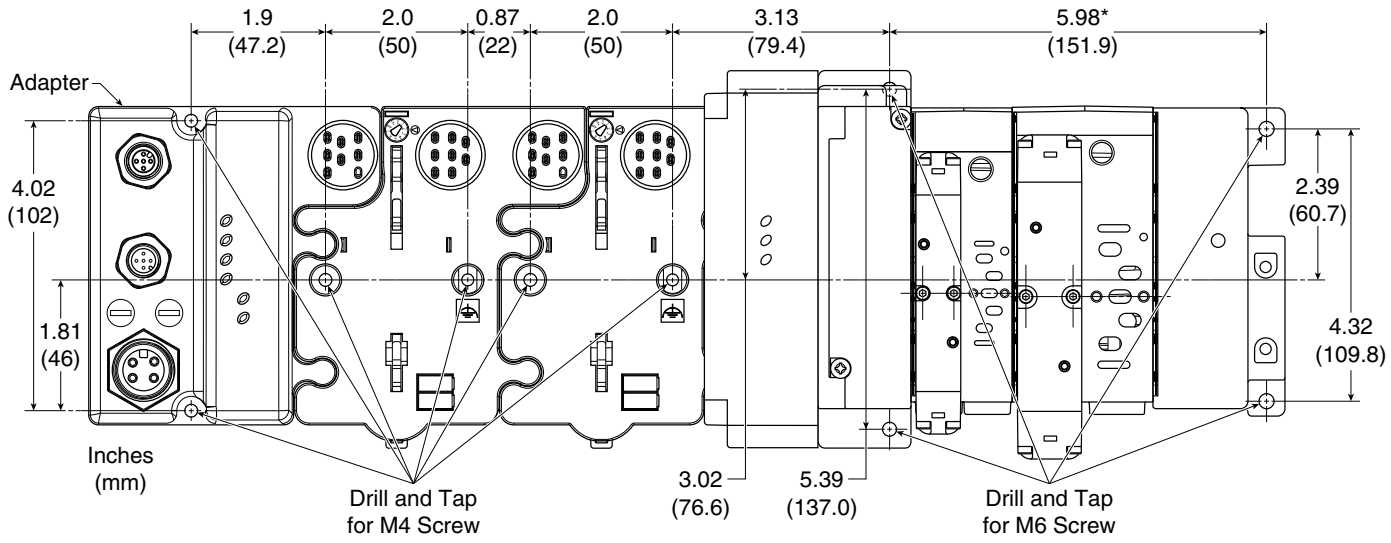
Mount the I/O Base

To mount the I/O base on a wall or panel, use the screw holes provided in the base.

IMPORTANT

The I/O module must be mounted on a grounded metal mounting plate or other conductive surface.

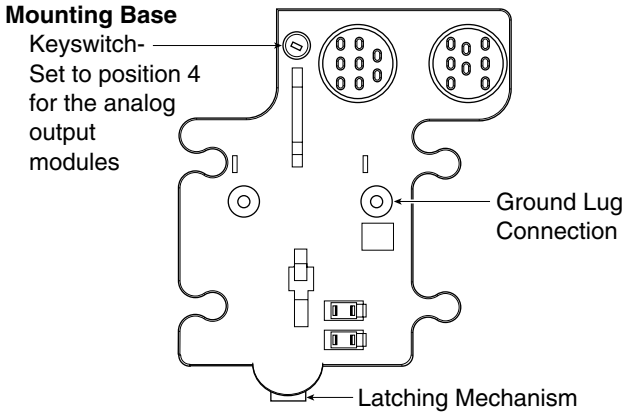
A mounting illustration for the base with an adapter is shown below.



*Depending on the type and number of manifolds, this dimension may vary. Consult Ross for specific information.

Install the Mounting Base as Follows:

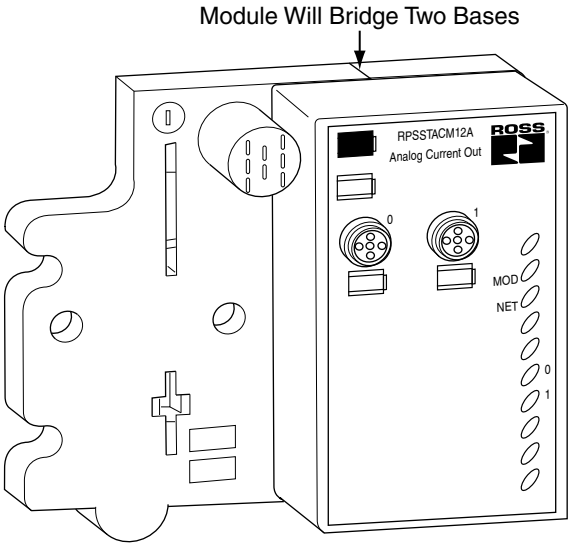
1. Lay out the required points as shown above in the drilling dimension drawing.
2. Drill the necessary holes for #8 (M4) machine or self-tapping screws.
3. Mount the base using #8 (M4) screws.
4. Ground the system using the ground lug connection. (The ground lug connection is also a mounting hole.)



Install the Analog Output Module

To Install the Analog Output Module, Proceed as Follows:

1. Using a bladed screwdriver, rotate the keyswitch on the mounting base clockwise until the number 4 aligns with the notch in the base.
2. Position the module vertically above the mounting base. The module will bridge two bases.



3. Push the module down until it engages the latching mechanism. You will hear a clicking sound when the module is properly engaged.

The locking mechanism will lock the module to the base.

Remove the Analog Output Module From the Mounting Base

To Remove the Module from the Mounting Base:

1. Put a flat blade screwdriver into the slot of the orange latching mechanism.
2. Push the screwdriver toward the I/O module to disengage the latch. The module will lift up off the base.
3. Pull the module off of the base.

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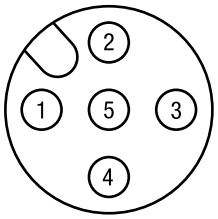
Wire the Analog Output Modules

Following are wiring instructions for the analog output modules.

RPSSTACM12A and RPSSTAVM12A



(view into connector)

Pin 1 - Output 0 (M12-A)
Output 1 (M12-B)

Pin 2 - 24VDC

Pin 3 - Common

Pin 4 - Common

Pin 5 - No Connect

IMPORTANT

Analog modules have earth grounded metal rings. This should be considered when choosing shielded cables and grounding techniques.

ATTENTION

Make sure all connectors and caps are securely tightened to properly seal the connections against leaks and maintain IP67 requirements.

Communicate With Your Module

I/O messages are sent to (consumed) and received from (produced) the I/O modules. These messages are mapped into the processor's memory. These I/O analog output modules produce 2 bytes of input data (scanner Rx - fault status). They consume 4 bytes of output data (scanner Tx).

Default Data Map for the Analog Output Modules

RPSSTACM12A and RPSSTAVM12A

Message Size: 2 Bytes

	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Produces (Scanner Rx)	High Byte-Channel 1 Status								Low Byte-Channel 0 Status							
	Not Used				HCA	LCA	CM	CF	Not Used				HCA	LCA	CM	CF

Where: CF = Channel Fault Status, 0 = no error, 1 = fault
CM = Calibration Mode; 0 = normal, 1 = calibration mode
LCA = Low Clamp Alarm; 0 = no error, 1 = fault
HCA = High Clamp Alarm; 0 = no error, 1 = fault

RPSSTACM12A and RPSSTAVM12A

Message Size: 4 Bytes

	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Consumes (scanner Tx)	Output Channel 0 High Byte								Output Channel 0 Low Byte							
	Output Channel 1 High Byte								Output Channel 1 Low Byte							

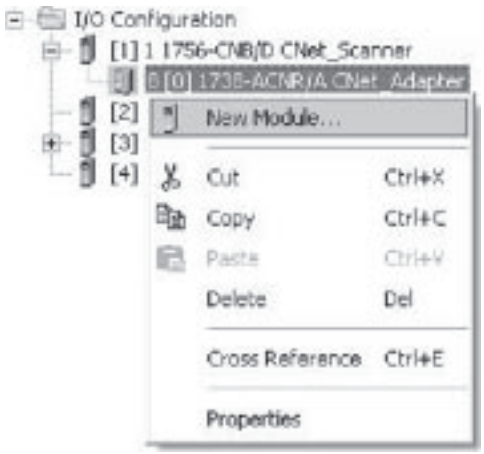
EDS File Requirements

The EDS files are available online at www.rosscontrols.com/rosslit.htm.

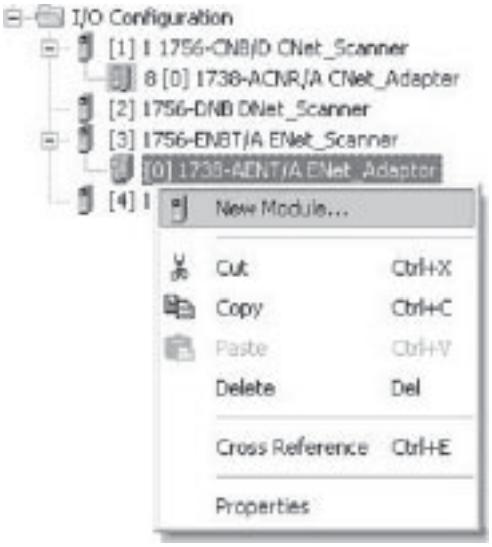
Add Analog Output Modules to RSLogix 5000 I/O Configuration

To add your analog output modules to RSLogix 5000 I/O configuration, follow these steps:

- In RSLogix 5000:
  - For ControlNet, highlight the ***RPSSCCNA*** or ***1738-ACNR (Shown)***, right click and select ***New Module***.

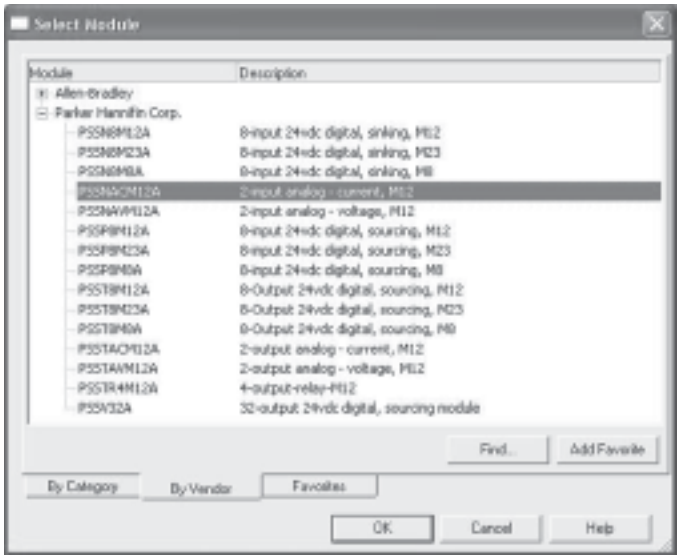


  - For EtherNet/IP, highlight the ***RPSSCENA*** or ***1738-AENT (Shown)***, right click and select ***New Module***.

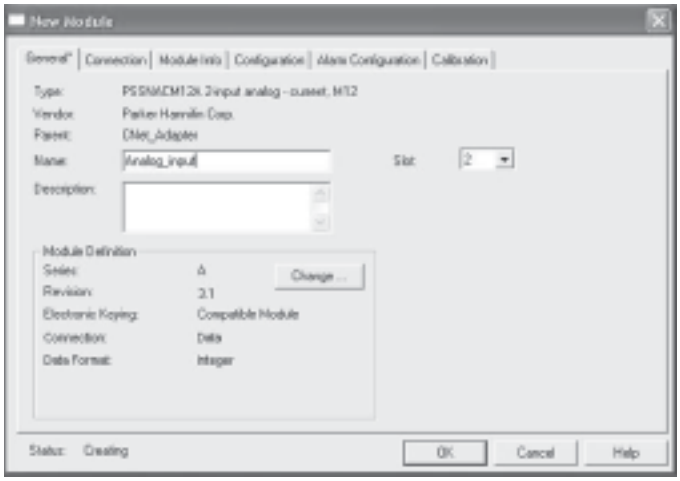


If your RSLogic 5000 is Version 15.X or greater:

- Choose the ***RPSSTACM12A*** module from the list of Parker modules.



- Enter a name and click OK.



- Notice that the RPSSTACM12A is now under the I/O

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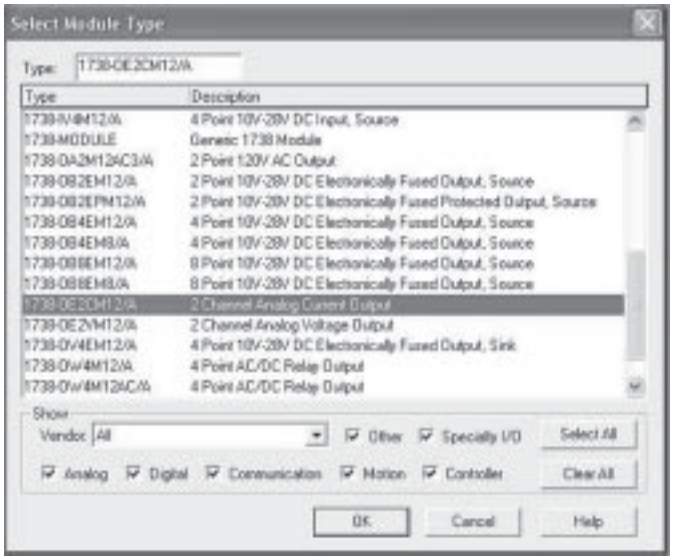
configuration.

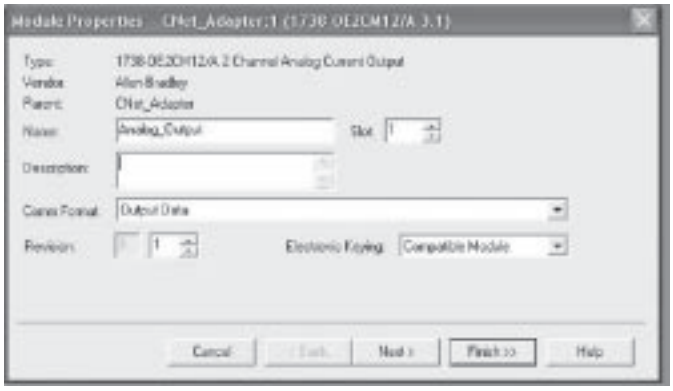
If your RSLogic 5000 is Version 13.X:

- Choose the equivalent Rockwell Automation module from the list of modules.



Serial Bus Modules	Equivalent Rockwell Automation 1738 ArmorPoint Modules
RPSSTACM12A	1738-OE2CM12
RPSSTAVM12A	1738-OE2VM12

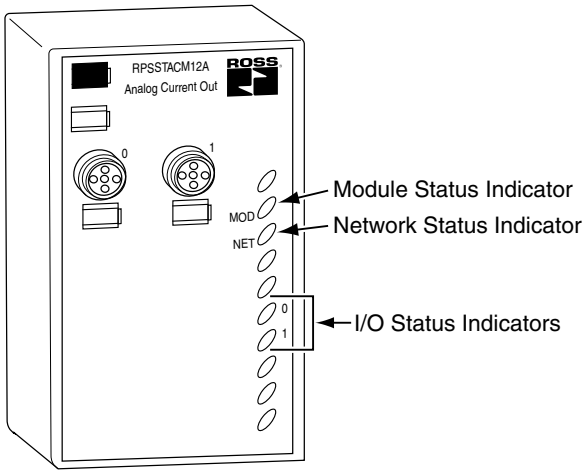
- Enter a name (optional), slot number, and comm. format. Make sure to choose ***Compatible Module for Electronic Keying*** setting.



- Choose ***Next*** to set **RPI.**
- Choose ***Finish***. Notice that the analog output module is now under the I/O configuration

Troubleshoot With the Indicators

RPSSTACM12A



Indication	Probable Cause
Module Status	
Off	No power applied to device
Green	Device operating normally
Flashing Green	Device needs commissioning due to missing, incomplete, or incorrect configuration
Flashing Red	Recoverable fault
Red	Unrecoverable fault - may require device replacement
Flashing Red/Green	Device is in self-test

Indication	Probable Cause
Network Status	
Off	Device is not on line: - Device has not completed dup_MAC-id test. - Device not powered - check module status indicator.
Flashing Green	Device is on line but has no connections in the established state.
Green	Device is on line and has connections in the established state.
Flashing Red	One or more I/O connections in timed-out state.
Red	Critical link failure - failed communication device. Device detected error that prevents it from communicating on the network.
Flashing Red/Green	Communication faulted device - the device has detected a network access error and is in communication faulted state. Device has received and accepted an Identity Communication Faulted Request - long protocol message.

Indication	Probable Cause	
I/O Status	**RPSSTAVM12A**	**RPSSTACM12A**
Off	Module in CAL mode	
Solid Green	Device operating normally	
Flashing Green	Channel being calibrated	
Flashing Red	Low or High Clamp	Open wire or no power
Solid Red	No power	Not used

Specifications - Following are specifications for the RPSSTACM12A and RPSSTAVM12A analog output modules.

Analog Output Modules	
Outputs per Module	2 single ended, nonisolated
Output Voltage	RPSSTAVM12A 0V output until communication established 0-10V (user configurable) (0.0V under, +5V over) ±10V (user configurable) (-0.5V under, +5V over)
Output Current	0 mA output until communication established 4-20 mA user configurable 0-20 mA user configurable
Resolution	RPSSTACM12A 13 bits - over 0-21 mA 2.5µA/cnt (average value - typical range: 2.3-2.7µA/cnt) RPSSTAVM12A 14 bits (13 plus sign) 1.28µV/cnt in unipolar or bipolar mode
Absolute Accuracy[1]	0.1% Full Scale @ 25°C
Accuracy Drift w/Temp.	RPSSTACM12A - 30ppm/°C RPSSTAVM12A - 5ppm/°C
Resistive Load on mA Output	RPSSTACM12A - 0-750kΩ
Current Load on Output, Maximum	RPSSTAVM12A - 3 mA
Conversion Type	Digital to analog converter
Conversion Rate	RPSSTACM12A - 16µs RPSSTAVM12A - 20µs
Data Format	Signed integer
General Specifications	
Calibration	Factory calibrated
Step Response to 63% of FS	24µs
Indicators	1 green/red module status indicator, logic side 1 green/red network status indicator, logic side 2 green/red output status indicators, logic side
Keyswitch Position	4
PointBus Current	75 mA @ 5VDC
Power Dissipation - Maximum at 28.8VDC	RPSSTACM12A 750Ω load on each output - 1.23W 0Ω load on each output - 1.83W RPSSTAVM12A 1.0W
Thermal Dissipation - Maximum at 28.8VDC	RPSSTACM12A 750Ω load on each output - 4.19 BTU/hr. 0Ω load on each output - 6.24 BTU/hr. RPSSTAVM12A 3.4 BTU/hr.
Isolation Voltage (continuous voltage withstand rating)	50V rms Tested at 1250VAC rms for 60s
External DC Power Supply Voltage Voltage Range Supply Current	 24VDC nominal 10-28.8VDC RPSSTACM12A: 70 mA @ 24VDC (including outputs @ 20 mA) RPSSTAVM12A: 35 mA @ 24VDC (including outputs @ 3 mA)
Dimensions Imperial (Metric)	1.25H x 2.63W x 4.25D (31.75H x 66.80W x 107.95D)
Operating Temperature	IEC 60068-2-1 (Test Ad, Operating Cold), IEC 60068-2-2 (Test Bd, Operating Dry Heat), IEC 60068-2-14 (Test Nb, Operating Thermal Shock): -20 to 60°C (-4 to 140°F)
Storage Temperature	IEC 60068-2-1 (Test Ab, Un-packaged Non-operating Cold), IEC 60068-2-2 (Test Bb, Un-packaged Non-operating Dry Heat), -40 to 85°C (-40 to 185°F)
Relative Humidity	IEC 60068-2-30 (Test Db, Un-packaged Non-operating Damp Heat): 5 to 95% non-condensing
Shock	IEC60068-2-27 (Test Ea, Unpackaged Shock): Operating 30g, Non-operating 50g
Vibration	IEC60068-2-6 (Test Fc, Operating): 5g @ 10 to 500Hz
ESD Immunity	IEC 61000-4-2: 6kV contact discharges 8kV air discharges
Radiated RF Immunity	IEC 61000-4-3: 10V/m with 1kHz sine-wave 80%AM from 30MHz to 2000MHz 10V/m with 200Hz 50% Pulse 100%AM at 900Mhz 10V/m with 200Hz 50% Pulse 100%AM at 1890Mhz
EFT/B Immunity	IEC 61000-4-4: ±3kV at 5kHz on signal ports
Surge Transient Immunity	IEC 61000-4-5: ±2kV line-earth(CM) on shielded ports
Conducted RF Immunity	IEC 61000-4-6: 10Vrms with 1kHz sine-wave 80%AM from 150kHz to 80MHz
Emissions	CSPR 11: Group 1, Class A
Enclosure Type Rating	Meets IP65/66/67 (when marked)
Mounting Base Screw Torque	#8 screw, 7.5 in. lbs. in Aluminum, 16 in. lbs. in Steel
Wiring Category[2]	1 - on signal ports
Weight Imperial (Metric)	0.637 lb. (0.289 kg)
Certifications: (when product is marked)	c-UL-us UL Listed Industrial Control Equipment, certified for US and Canada CE European Union 89/336/EEC EMC Directive, compliant with: EN 61000-6-4; Industrial Emissions EN 50082-2; Industrial Immunity EN 61326; Meas./Control/Lab., Industrial Requirements EN 61000-6-2; Industrial Immunity C- Tick Australian Radiocommunications Act, compliant with: AS/NZS CISPR 11; Industrial Emissions

1. Includes offset, gain, non-linearity and repeatability error terms.
2. Use this Conductor Category information for planning conductor routing. Refer to Publication A10324, “Industrial Automation Wiring and Grounding Guidelines”.

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Installation & Service Instructions
A10317

Serial Bus 24VDC Expansion Power Supply, Series A (RPSSSE24A)

ISSUED: August, 2007
Supersedes: None

⚠ WARNING

To avoid unpredictable system behavior that can cause personal injury and property damage:

- **Disconnect electrical supply (when necessary) before installation, servicing, or conversion.**
- **Disconnect air supply and depressurize all air lines connected to this product before installation, servicing, or conversion.**
- **Operate within the manufacturer's specified pressure, temperature, and other conditions listed in these instructions.**
- **Medium must be moisture-free if ambient temperature is below freezing.**
- **Service according to procedures listed in these instructions.**
- **Installation, service, and conversion of these products must be performed by knowledgeable personnel who understand how pneumatic products are to be applied.**
- **After installation, servicing, or conversion, air and electrical supplies (when necessary) should be connected and the product tested for proper function and leakage. If audible leakage is present, or the product does not operate properly, do not put into use.**
- **Warnings and specifications on the product should not be covered by paint, etc. If masking is not possible, contact your local representative for replacement labels.**

Safety Guide

For more complete information on recommended application guidelines, see the Installation Safety Guidelines section of Bulletin 600 (Form A10309) or you can download the Installation Safety Guidelines at: www.rosscontrols.com/rosslit.htm.

Introduction

Follow these instructions when installing, operating, or servicing the product.

Serial Bus 24VDC Expansion Power Supply, Series A

(RPSSSE24A)

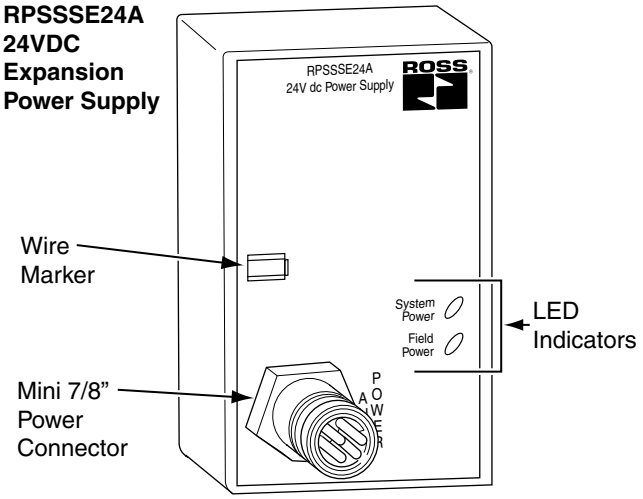
The 24VDC expansion power supply unit (RPSSSE24A) passes 24VDC field power to the I/O modules to the right of the power supply. This unit extends the backplane bus power for up to 17 I/O modules to the right of the supply and creates a new field voltage partition.

The expansion power supply also separates field power from I/O modules to the left of the unit, effectively providing functional and logical partitioning for:

- separating field power between input and output modules
- separating field power to the analog and digital modules
- grouping modules to perform a specific task or function

You can use multiple expansion power units with the I/O adapters to assemble a full system. For instance, if you are using the RPSSCDM12A or RPSSCDM18PA adapter, you may use a RPSSSE24A expansion power unit to add additional modules in 5 to 17 module increments. For example, if you had a 36 module system with a I/O adapter, you would have two RPSSSE24A expansion power units to provide more PointBus current for modules to the right of the supply.

RPSSSE24A 24VDC Expansion Power Supply



ATTENTION

⚠

Do not connect 120/240VAC to the RPSSSE24A terminals. Damage to the supply will result.

ATTENTION

⚠

You can only use the RPSSSE24A expansion power unit with the I/O adapters.

⚠ WARNING

FAILURE OR IMPROPER SELECTION OR IMPROPER USE OF THE PRODUCTS AND/OR SYSTEMS DESCRIBED HEREIN OR RELATED ITEMS CAN CAUSE DEATH, PERSONAL INJURY AND PROPERTY DAMAGE.

This document and other information from ROSS CONTROLS, its subsidiaries and authorized distributors provide product and/or system options for further investigation by users having technical expertise. It is important that you analyze all aspects of your application, including consequences of any failure and review the information concerning the product or systems in the current product catalog. Due to the variety of operating conditions and applications for these products or systems, the user, through its own analysis and testing, is solely responsible for making the final selection of the products and systems and assuring that all performance, safety and warning requirements of the application are met.

The products described herein, including without limitation, product features, specifications, designs, availability and pricing, are subject to change by ROSS CONTROLS and its subsidiaries at any time without notice.

EXTRA COPIES OF THESE INSTRUCTIONS ARE AVAILABLE FOR INCLUSION IN EQUIPMENT / MAINTENANCE MANUALS THAT UTILIZE THESE PRODUCTS. CONTACT YOUR LOCAL REPRESENTATIVE.

Important User Information

Solid state equipment has operational characteristics differing from those of electromechanical equipment. *Safety Guidelines for the Application, Installation and Maintenance of Solid State Controls (Form #A10325)* (available online at www.rosscontrols.com/rosslit.htm), describes some important differences between solid state equipment and hard-wired electromechanical devices. Because of these differences, and also because of the wide variety of uses for solid state equipment, all persons responsible for applying this equipment must satisfy themselves that each intended application of this equipment is acceptable.

In no event will ROSS CONTROLS® be responsible or liable for indirect or consequential damages to persons or property resulting from the use or application of this equipment.

The examples and diagrams in this manual are included solely for illustrative purposes. Because of the many variables and requirements associated with any particular installation, ROSS CONTROLS cannot assume responsibility or liability for actual use based on the examples and diagrams.

No patent liability is assumed by ROSS CONTROLS with respect to use of information, circuits, equipment, or software described in this manual.

Reproduction of the contents of this manual, in whole or in part, without written permission of ROSS CONTROLS is prohibited.

Throughout this manual we use notes to make you aware of safety considerations.

WARNING	Identifies information about practices or circumstances that can cause an explosion in a hazardous environment, which may lead to personal injury or death, property damage, or economic loss.
IMPORTANT	Identifies information that is critical for successful application and understanding of the product.
ATTENTION	Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss. Attentions help you: • Identify a Hazard • Avoid a Hazard • Recognize the Consequence
SHOCK HAZARD	Labels may be located on or inside the equipment to alert people that dangerous voltage may be present.
BURN HAZARD	Labels may be located on or inside the equipment to alert people that surfaces may be dangerous temperatures.

ATTENTION

Environment and Enclosure

This equipment is intended for use in overvoltage Category II applications (as defined in IEC publication 60664-1), at altitudes up to 2000 meters without derating. This equipment is considered Group 1, Class A industrial equipment according to IEC/CISPR Publication 11. Without appropriate precautions, there may be potential difficulties ensuring electromagnetic compatibility in other environments due to conducted as well as radiated disturbance. This equipment is supplied as "enclosed" equipment. It should not require additional system enclosure when used in locations consistent with the enclosure type ratings stated in the Specifications section of this publication. Subsequent sections of this publication may contain additional information regarding specific enclosure type ratings, beyond what this product provides, that are required to comply with certain product safety certifications.

NOTE: See NEMA Standards publication 250 and IEC publication 60529, as applicable, for explanations of the degrees of protection provided by different types of enclosure. Also, see the appropriate sections in this publication, as well as the publication A10324 ("Industrial Automation Wiring and Grounding Guidelines"), for additional installation requirements pertaining to this equipment.

ATTENTION

Preventing Electrostatic Discharge

This equipment is sensitive to electrostatic discharge, which can cause internal damage and affect normal operation. Follow these guidelines when you handle this equipment:

- Touch a grounded object to discharge potential static.
- Wear an approved grounding wrist strap.
- Do not touch connectors or pins on component boards.
- Do not touch circuit components inside the equipment.
- If available, use a static-safe workstation.
- When not in use, store the equipment in appropriate static-safe packaging.

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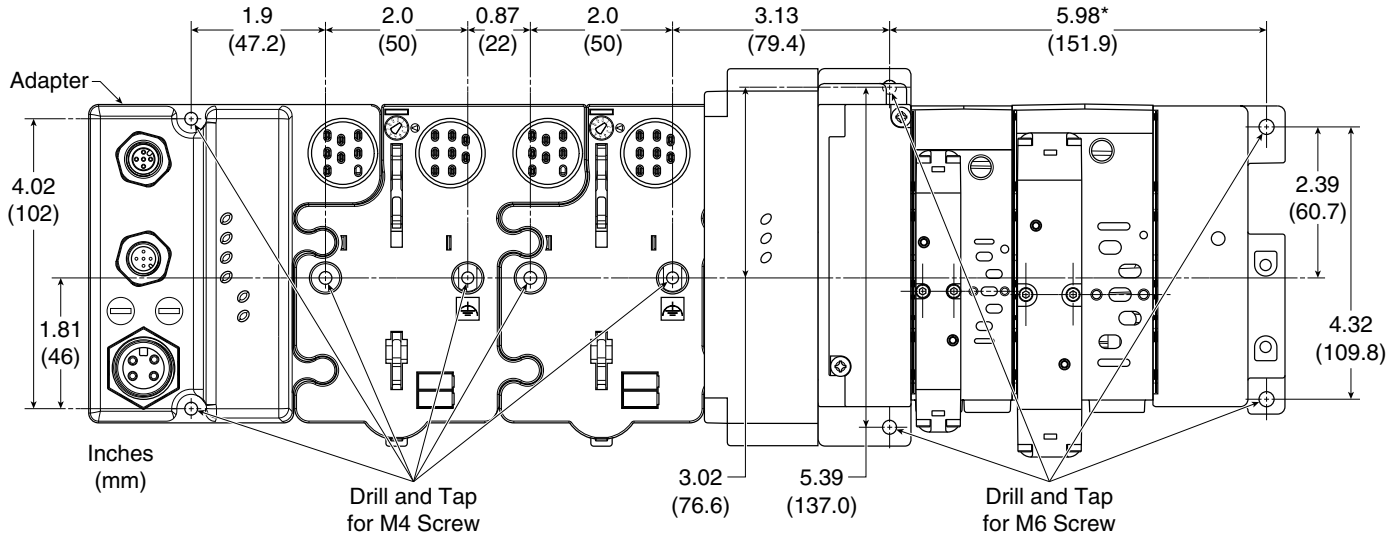
Mount the I/O Base

To mount the I/O base on a wall or panel, use the screw holes provided in the base.

IMPORTANT

The I/O module must be mounted on a grounded metal mounting plate or other conductive surface.

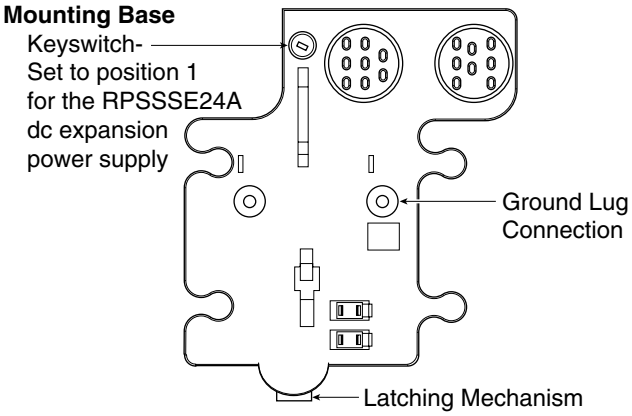
A mounting illustration for the base with an adapter is shown below.



*Depending on the type and number of manifolds, this dimension may vary. Consult Ross for specific information.

Install the Mounting Base as Follows:

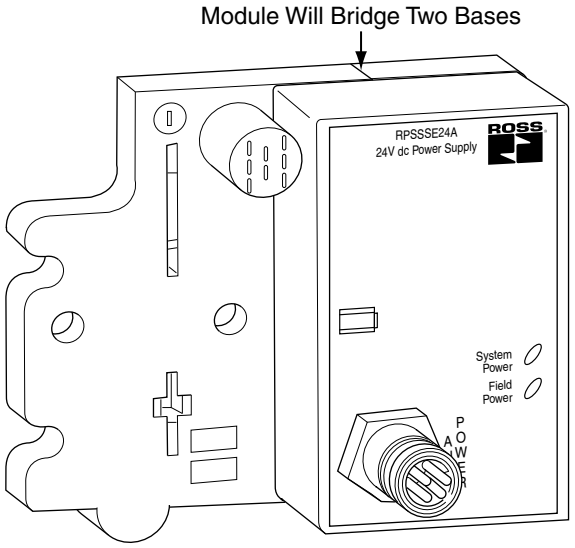
1. Lay out the required points as shown above in the drilling dimension drawing.
2. Drill the necessary holes for #8 (M4) machine or self-tapping screws.
3. Mount the base using #8 (M4) screws.
4. Ground the system using the ground lug connection. (The ground lug connection is also a mounting hole.)



Install the 24VDC Expansion Power Supply

To Install the Power Supply, Proceed as Follows:

1. Using a bladed screwdriver, rotate the keyswitch on the mounting base clockwise until the number 1 aligns with the notch in the base.
2. Position the power supply vertically above the mounting base. The module will bridge two bases.



3. Push the power supply down until it engages the orange latching mechanism. You will hear a clicking sound when the power supply is properly engaged. The locking mechanism will lock the power supply to the base.

Remove the 24VDC Expansion Power Supply From the Mounting Base

To Remove the Power Supply from the Mounting Base:

1. Put a flat blade screwdriver into the slot of the orange latching mechanism.
2. Push the screwdriver toward the I/O module to disengage the latch. The module will lift up off the base.
3. Pull the module off of the base.

Install a Replacement RPSSSE24A to an Existing System

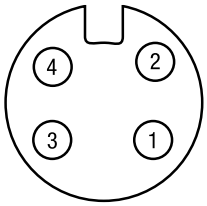
1. Remove the module to the right of the power supply from the mounting base.
2. If you have not done so already, remove the existing power supply from the mounting base.
3. Position the replacement power supply vertically above the mounting base.
4. Push the power supply down until it engages the orange latching mechanism. You will hear a clicking sound when the power supply is properly engaged and locked to the base.
5. Place the module to the right of the power supply back onto the mounting base.

Wire the 24VDC Expansion Power Supply

Following are wiring instructions for the 24VDC Expansion Power Supply.

RPSSSE24A

Male In Connector (Mini 7/8")



(view into connector)
Pin 1 - User Power +
Pin 2 - Adapter Power +
Pin 3 - Adapter Power -
Pin 4 - User Power -

Note: User power is the 24VDC power for field devices. Adapter power is the 24VDC power for RPSSSE24A. It is converted to 5VDC to power isysNet modules.

ATTENTION

Make sure all connectors and caps are securely tightened to properly seal the connections against leaks and maintain IP67 requirements.

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Specifications

Following are specifications for the RPSSSE24A Power Supply.

24VDC Expansion Power Supply - RPSSSE24A	
I/O Module Capacity	5 to 17 I/O modules depending on each module's current rating
Power Supply	In order to comply with CE Low Voltage Directives (LVD), you must use a Safety Extra Low Voltage (SELV) or a Protected Extra Low Voltage (PELV) power supply to power the adapter.
Inputs Voltage Rating	12VDC, 24VDC nominal 10-28.8VDC range
Operating Voltage	10-28.8VDC
Input Current, Maximum	6A for 10ms
Backplane Output Current	5VDC, 1.3A
Field Side Power Requirements, Maximum	24VDC (+20% = 28.8VDC) @ 400 mA
Indicators	1 Green Field Power Status Indicator 1 Green 5V System Power Indicator
Module Location	Between I/O modules in system Breaks field power bus
PointBus Output Current	1A at 10-19.2V input; 1.3A at 19.2-28.8V input
Input Overvoltage Protection	Reverse polarity protected
Interruption	Output voltage will stay within specifications when input drops out for 10ms at 10V with maximum load
General Specifications	
Power Consumption, Maximum	9.8W @ 28.8VDC
Power Dissipation, Maximum	3.0W @ 28.8VDC
Thermal Dissipation, Maximum	10.0 BTU/hr. @ 28.8VDC
Isolation Voltage (continuous-voltage withstand rating)	50V rms Tested at 1250VAC rms for 60s
Field Power Bus Supply Voltage Voltage Range Supply Current	 12VDC, 24VDC nominal 10-28.8VDC range 10A maximum
Dimensions Inches (Millimeters)	1.25H x 2.63W x 4.25D (31.75H x 66.80W x 107.95D)
Operating Temperature	IEC 60068-2-1 (Test Ad, Operating Cold), IEC 60068-2-2 (Test Bd, Operating Dry Heat), IEC 60068-2-14 (Test Nb, Operating Thermal Shock): -20 to 60°C (-4 to 140°F)
Storage Temperature	IEC 60068-2-1 (Test Ab, Un-packaged Non-operating Cold), IEC 60068-2-2 (Test Bb, Un-packaged Non-operating Dry Heat), -40 to 85°C (-40 to 185°F)
Relative Humidity	IEC 60068-2-30 (Test Db, Un-packaged Non-operating Damp Heat): 5-95% non-condensing
Shock	IEC60068-2-27 (Test Ea, Unpackaged Shock): Operating 30g Non-operating 50g
Vibration	IEC60068-2-6 (Test Fc, Operating): 5g @ 10-500Hz
ESD Immunity	IEC 61000-4-2: 6kV contact discharges 8kV air discharges
Radiated RF Immunity	IEC 61000-4-3: 10V/m with 1kHz sine-wave 80%AM from 30MHz to 2000MHz 10V/m with 200Hz 50% Pulse 100%AM at 900Mhz 10V/m with 200Hz 50% Pulse 100%AM at 1890Mhz

General Specifications (continued)		
EFT/B Immunity	IEC 61000-4-4: ±4kV at 5kHz on power ports	
Surge Transient Immunity	IEC 61000-4-5: ±1kV line-line(DM) and ±2kV line-earth(CM) on power ports	
Conducted RF Immunity	IEC 61000-4-6: 10Vrms with 1kHz sine-wave 80%AM from 150kHz to 80MHz	
Emissions	CSPR 11: Group 1, Class A	
Enclosure Type Rating	Meets IP65/66/67 (when marked)	
Mounting Base Screw Torque	#8 screw, 7.5 in. lbs. in Aluminum, 16 in. lbs. in Steel	
Weight Imperial (Metric)	0.637 lb. (0.289 kg)	
Wiring Category[1]	1 - on power ports	
Keyswitch Position	1	
Certifications: (when product is marked)	c-UL-us	UL Listed Industrial Control Equipment, certified for US and Canada
	CE	European Union 89/336/EEC EMC Directive, compliant with: EN 61000-6-4; Industrial Emissions EN 50082-2; Industrial Immunity EN 61326; Meas./Control/Lab., Industrial Requirements EN 61000-6-2; Industrial Immunity
	C-Tick	Australian Radiocommunications Act, compliant with: AS/NZS CISPR 11; Industrial Emissions

1. Use this Conductor Category information for planning conductor routing. Refer to Publication A10324, “Industrial Automation Wiring and Grounding Guidelines”.

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Installation & Service Instructions
A10318

Serial Bus 24 VDC Input Modules, Series A
(RPSSN8M8A, RPSSN8M12A, RPSSN8M23A, RPSSP8M8A, RPSSP8M12A, RPSSP8M23A)

ISSUED: August, 2007
Supersedes: None

⚠ WARNING

To avoid unpredictable system behavior that can cause personal injury and property damage:

- **Disconnect electrical supply (when necessary) before installation, servicing, or conversion.**
- **Disconnect air supply and depressurize all air lines connected to this product before installation, servicing, or conversion.**
- **Operate within the manufacturer's specified pressure, temperature, and other conditions listed in these instructions.**
- **Medium must be moisture-free if ambient temperature is below freezing.**
- **Service according to procedures listed in these instructions.**
- **Installation, service, and conversion of these products must be performed by knowledgeable personnel who understand how pneumatic products are to be applied.**
- **After installation, servicing, or conversion, air and electrical supplies (when necessary) should be connected and the product tested for proper function and leakage. If audible leakage is present, or the product does not operate properly, do not put into use.**
- **Warnings and specifications on the product should not be covered by paint, etc. If masking is not possible, contact your local representative for replacement labels.**

Safety Guide

For more complete information on recommended application guidelines, see the Installation Safety Guidelines section of Bulletin 600 (Form A10309) or you can download the Installation Safety Guidelines at: www.rosscontrols.com/rosslit.htm.

Introduction

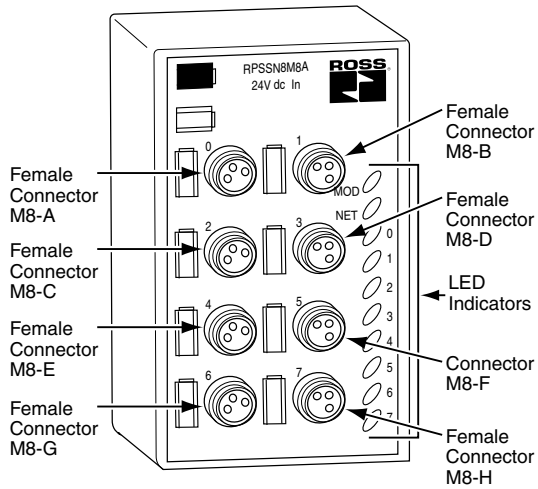
Follow these instructions when installing, operating, or servicing the product.

Serial Bus 24 VDC Input Modules, Series A

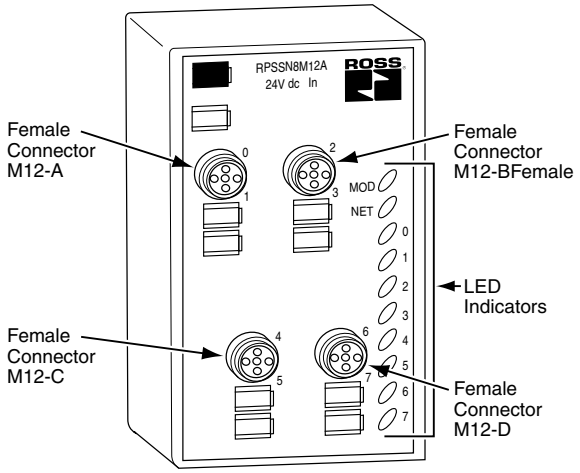
(RPSSN8M8A, RPSSN8M12A, RPSSN8M23A, RPSSP8M8A, RPSSP8M12A, RPSSP8M23A)

The sealed IP67 housing of these modules requires no enclosure. (Note that environmental requirements other than IP67 may require an additional appropriate housing.) I/O connectors are sealed M8 (pico) or M12 (micro) or M23 styles. The mounting base ships with the module.

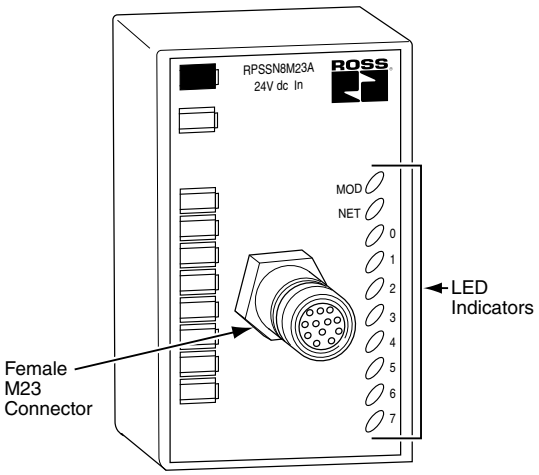
RPSSN8M8A



RPSSN8M12A



RPSSN8M23A



⚠ WARNING

FAILURE OR IMPROPER SELECTION OR IMPROPER USE OF THE PRODUCTS AND/OR SYSTEMS DESCRIBED HEREIN OR RELATED ITEMS CAN CAUSE DEATH, PERSONAL INJURY AND PROPERTY DAMAGE.

This document and other information from ROSS CONTROLS, its subsidiaries and authorized distributors provide product and/or system options for further investigation by users having technical expertise. It is important that you analyze all aspects of your application, including consequences of any failure and review the information concerning the product or systems in the current product catalog. Due to the variety of operating conditions and applications for these products or systems, the user, through its own analysis and testing, is solely responsible for making the final selection of the products and systems and assuring that all performance, safety and warning requirements of the application are met.

The products described herein, including without limitation, product features, specifications, designs, availability and pricing, are subject to change by ROSS CONTROLS and its subsidiaries at any time without notice.

EXTRA COPIES OF THESE INSTRUCTIONS ARE AVAILABLE FOR INCLUSION IN EQUIPMENT / MAINTENANCE MANUALS THAT UTILIZE THESE PRODUCTS. CONTACT YOUR LOCAL REPRESENTATIVE.

Important User Information

Solid state equipment has operational characteristics differing from those of electromechanical equipment. *Safety Guidelines for the Application, Installation and Maintenance of Solid State Controls (Form #A10325)* (available online at www.rosscontrols.com/rosslit.htm), describes some important differences between solid state equipment and hard-wired electromechanical devices. Because of these differences, and also because of the wide variety of uses for solid state equipment, all persons responsible for applying this equipment must satisfy themselves that each intended application of this equipment is acceptable.

In no event will ROSS CONTROLS® be responsible or liable for indirect or consequential damages to persons or property resulting from the use or application of this equipment.

The examples and diagrams in this manual are included solely for illustrative purposes. Because of the many variables and requirements associated with any particular installation, ROSS CONTROLS cannot assume responsibility or liability for actual use based on the examples and diagrams.

No patent liability is assumed by ROSS CONTROLS with respect to use of information, circuits, equipment, or software described in this manual.

Reproduction of the contents of this manual, in whole or in part, without written permission of ROSS CONTROLS is prohibited.

Throughout this manual we use notes to make you aware of safety considerations.

WARNING	Identifies information about practices or circumstances that can cause an explosion in a hazardous environment, which may lead to personal injury or death, property damage, or economic loss.
IMPORTANT	Identifies information that is critical for successful application and understanding of the product.
ATTENTION	Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss. Attentions help you: • Identify a Hazard • Avoid a Hazard • Recognize the Consequence
SHOCK HAZARD	Labels may be located on or inside the equipment to alert people that dangerous voltage may be present.
BURN HAZARD	Labels may be located on or inside the equipment to alert people that surfaces may be dangerous temperatures.

ATTENTION

Environment and Enclosure

This equipment is intended for use in overvoltage Category II applications (as defined in IEC publication 60664-1), at altitudes up to 2000 meters without derating. This equipment is considered Group 1, Class A industrial equipment according to IEC/CISPR Publication 11. Without appropriate precautions, there may be potential difficulties ensuring electromagnetic compatibility in other environments due to conducted as well as radiated disturbance. This equipment is supplied as "enclosed" equipment. It should not require additional system enclosure when used in locations consistent with the enclosure type ratings stated in the Specifications section of this publication. Subsequent sections of this publication may contain additional information regarding specific enclosure type ratings, beyond what this product provides, that are required to comply with certain product safety certifications.

NOTE: See NEMA Standards publication 250 and IEC publication 60529, as applicable, for explanations of the degrees of protection provided by different types of enclosure. Also, see the appropriate sections in this publication, as well as the publication A10324 ("Industrial Automation Wiring and Grounding Guidelines"), for additional installation requirements pertaining to this equipment.

ATTENTION

Preventing Electrostatic Discharge

This equipment is sensitive to electrostatic discharge, which can cause internal damage and affect normal operation. Follow these guidelines when you handle this equipment:

- Touch a grounded object to discharge potential static.
- Wear an approved grounding wrist strap.
- Do not touch connectors or pins on component boards.
- Do not touch circuit components inside the equipment.
- If available, use a static-safe workstation.
- When not in use, store the equipment in appropriate static-safe packaging.

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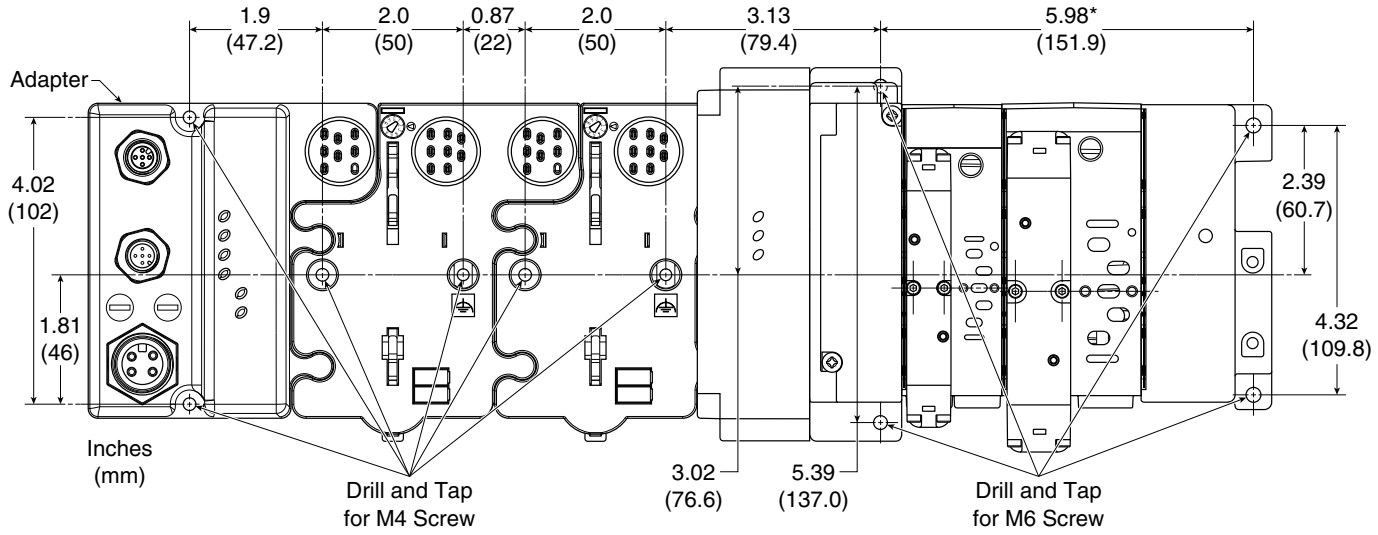
Mount the I/O Base

To mount the I/O base on a wall or panel, use the screw holes provided in the base.

IMPORTANT

The I/O module must be mounted on a grounded metal mounting plate or other conductive surface.

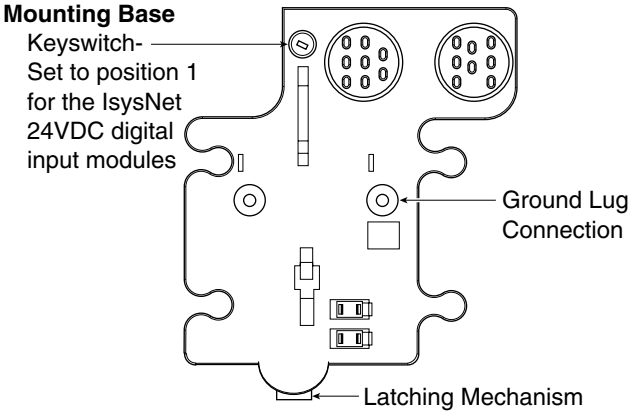
A drilling dimensions mounting illustration for the base with an adapter is shown below.



*Depending on the type and number of manifolds, this dimension may vary. Consult Ross for specific information.

Install the Mounting Base as Follows:

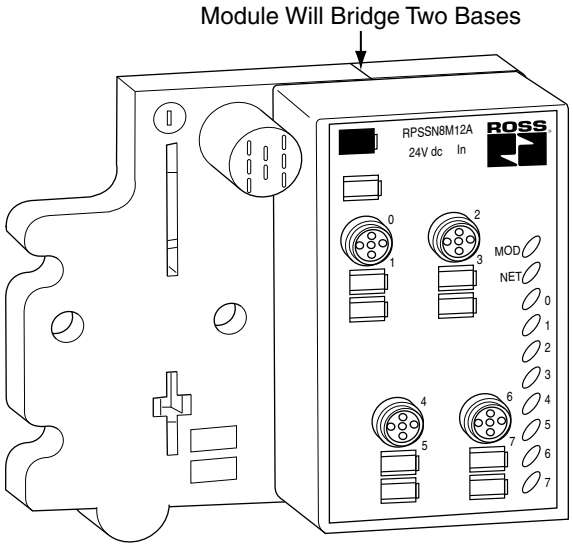
1. Lay out the required points as shown above in the drilling dimension drawing.
2. Drill the necessary holes for #8 (M4) machine or self-tapping screws.
3. Mount the base using #8 (M4) screws.
4. Ground the system using the ground lug connection. (The ground lug connection is also a mounting hole.)



Install the Digital Input Module

To Install the Digital Input Module, Proceed as Follows:

1. Using a bladed screwdriver, rotate the keyswitch on the mounting base clockwise until the number 1 aligns with the notch in the base.
2. Position the module vertically above the mounting base. The module will bridge two bases.



3. Push the module down until it engages the latching mechanism. You will hear a clicking sound when the module is properly engaged. The locking mechanism will lock the module to the base.

Remove the Digital Input Module From the Mounting Base

To Remove the Module from the Mounting Base:

1. Put a flat blade screwdriver into the slot of the orange latching mechanism.
2. Push the screwdriver toward the I/O module to disengage the latch. The module will lift up off the base.
3. Pull the module off of the base.

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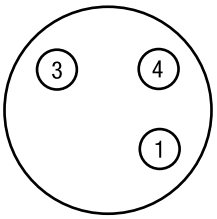
Wire the Input Modules

Following are wiring instructions for the digital input modules.

RPSSN8M8A
RPSSP8M8A



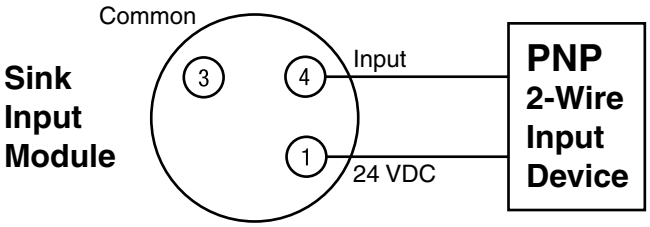
(view into connector)

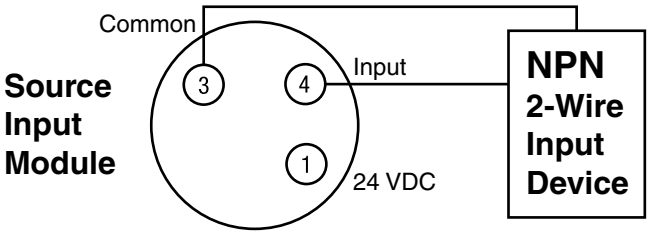
Pin 1 - 24VDC
Pin 3 - Common
Pin 4 - Input 0 (M8-A)
Input 1 (M8-B)
Input 2 (M8-C)
Input 3 (M8-D)
Input 4 (M8-E)
Input 5 (M8-F)
Input 6 (M8-G)
Input 7 (M8-H)

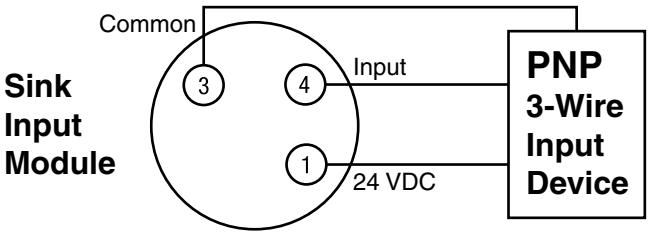
Sink Input modules (RPSSN8) require PNP type input device.

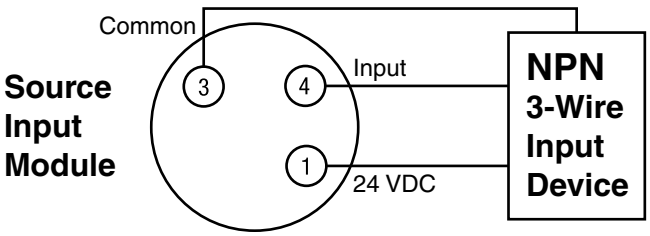
Source Input modules (RPSSP8) require NPN type input device.

Wiring examples (RPSSN8M8A and RPSSP8M8A shown):

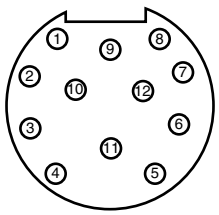








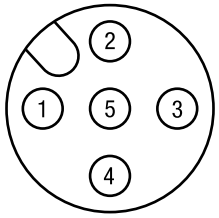
RPSSN8M23A
RPSSP8M23A



(view into connector)

Pin 1 - Input 0
Pin 2 - Input 1
Pin 3 - Input 2
Pin 4 - Input 3
Pin 5 - Input 4
Pin 6 - Input 5
Pin 7 - Input 6
Pin 8 - Input 7
Pin 9 - Return (Com)
Pin 10 - Return (Com)
Pin 11 - 24VDC
Pin 12 - Chassis

RPSSN8M12A
RPSSP8M12A



(view into connector)

Pin 1 - 24VDC
Pin 2 - Input 1 (M12-A)
Input 3 (M12-B)
Input 5 (M12-C)
Input 7 (M12-D)
Pin 3 - Common
Pin 4 - Input 0 (M12-A)
Input 2 (M12-B)
Input 4 (M12-C)
Input 6 (M12-D)
Pin 5 - No Connect

Digital Input Module

Input Module	Part Number
8 Digital Inputs M12 (NPN Sinking - Requires PNP Sourcing Input Device)	**RPSSN8M12A**
8 Digital Inputs M12 (PNP Sourcing -Requires NPN Sinking Input Device)	**RPSSP8M12A**
8 Digital Inputs M8 (NPN Sinking - Requires PNP Sourcing Input Device)	**RPSSN8M8A**
8 Digital Inputs M8 (PNP Sourcing - Requires NPN Sinking Input Device)	**RPSSP8M8A**
8 Digital Inputs M23 12-Pin (PNP Sourcing - Requires NPN Sinking Input Device)	**RPSSP8M23A**
8 Digital Inputs M23 12-Pin (NPN Sinking - Requires PNP Sourcing Input Device)	**RPSSN8M23A**

ATTENTION

Make sure all connectors and caps are securely tightened to properly seal the connections against leaks and maintain IP67 requirements.

Communicate With Your Module

I/O messages are sent to (consumed) and received from (produced) the I/O modules. These messages are mapped into the processor's memory. These I/O input modules produce 1 byte of input data (scanner Rx - status). They do not consume I/O data (scanner Tx).

Default Data Map for the Input Modules

RPSSN8M8A, RPSSN8M12A, RPSSN8M23A, RPSSP8M8A, RPSSP8M12A, RPSSP8M23A

Message Size: 1 Byte

	7	6	5	4	3	2	1	0	
Produces (Scanner Rx)	Ch7	Ch6	Ch5	Ch4	Ch3	Ch2	Ch1	Ch0	Channel Status

Where: 0 = OFF, 1 = ON

EDS File Requirements

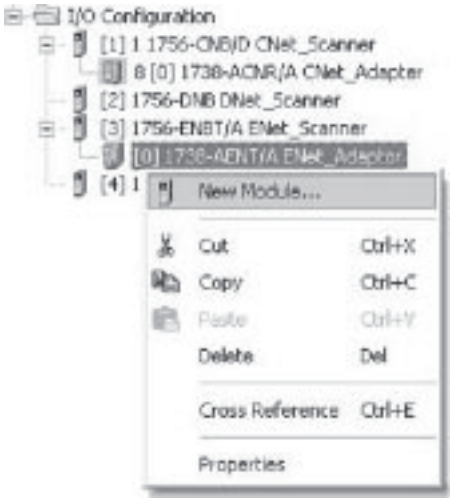
The EDS files are available online at www.rosscontrols.com/rosslit.htm.

Add 24 VDC Input Modules to RSLogix 5000 I/O Configuration

To add your input modules to RSLogix 5000 I/O configuration, follow these steps:

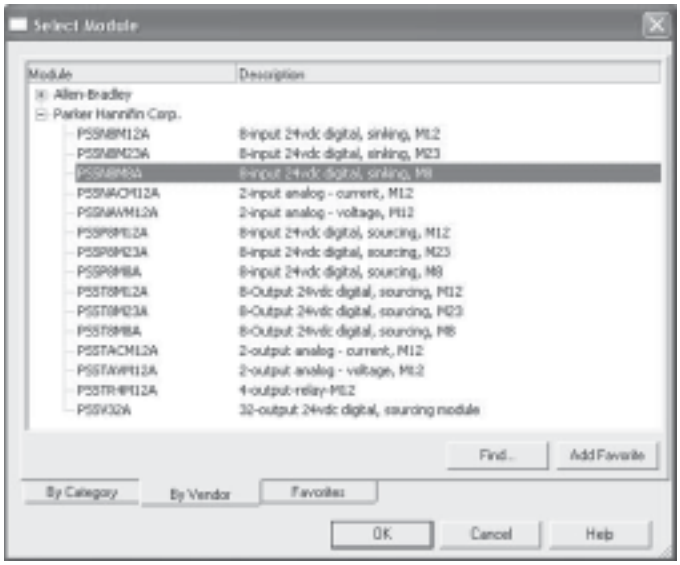
- In RSLogix 5000:
  - For ControlNet, highlight the ***RPSSCCNA*** or ***1738-ACNR (Shown)***, right click and select ***New Module***.

  - For EtherNet/IP, highlight the ***RPSSCENA*** or ***1738-AENT (Shown),*** right click and select ***New Module***.

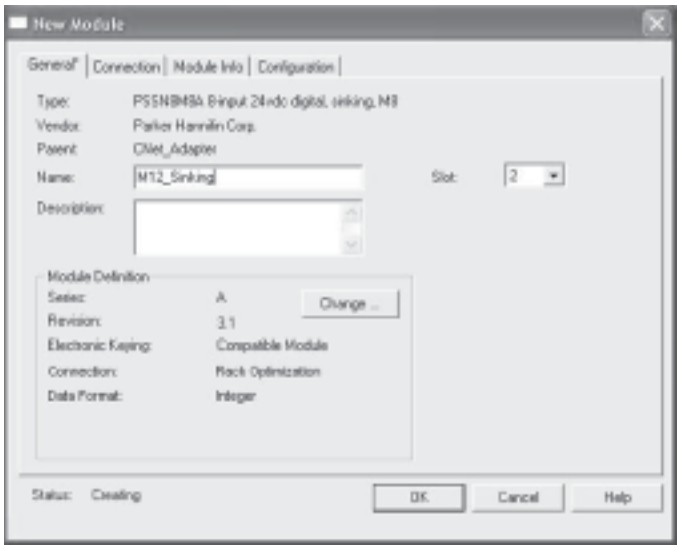


If your RSLogic 5000 is Version 15.X or greater:

- Choose the ***RPSSN8M8A*** module from the list of Parker modules.



- Enter a name and click OK.



- Notice that the RPSSN8M8A is now under the I/O configuration.

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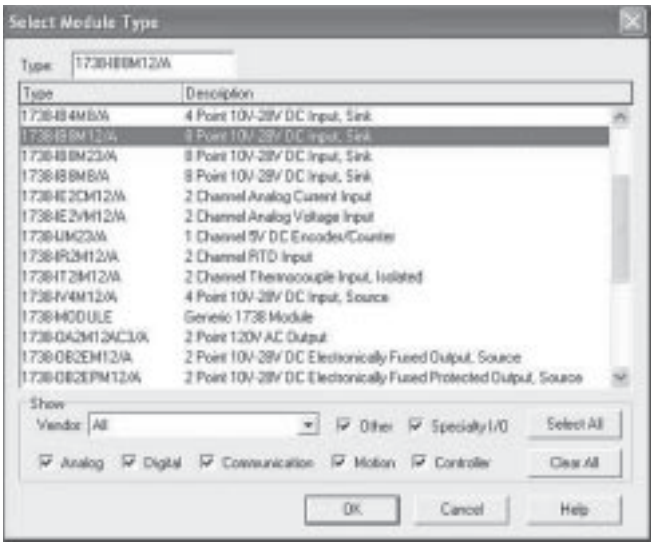
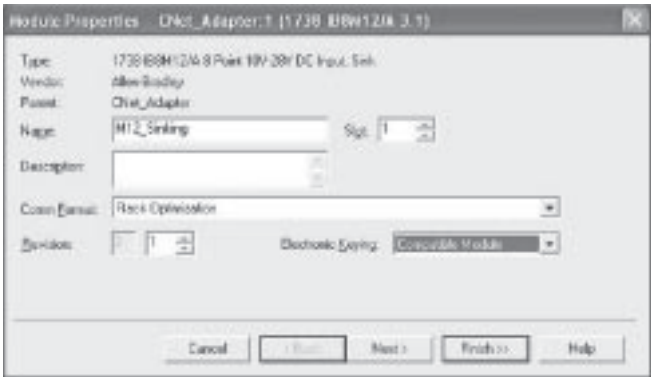
If your RSLogic 5000 is Version 13.X:

- Choose the equivalent Rockwell Automation module from the list of modules.



Serial Bus Modules	Equivalent Rockwell Automation 1738 ArmorPoint Modules
RPSSN8M8A	1738-IB8M8
RPSSN8M12A	1738-IB8M12
RPSSN8M23A	1738-IB8M23
RPSSP8M8A	1738-IV8M8
RPSSP8M12A	1738-IV8M12
RPSSP8M23A	1738-IV8M23

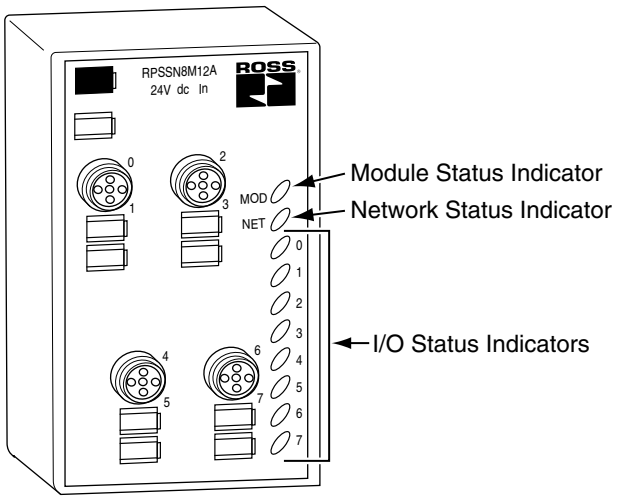
- Enter a name (optional), slot number, and communication format. Make sure to choose ***Compatible Module for Electronic Keying*** setting.



- Choose ***Next*** to set **RPI.**
- Choose ***Finish***. Notice that the input module is now under the I/O configuration

Troubleshoot With the Indicators

RPSSN8M12A



Indication	Probable Cause
Module Status	
Off	No power applied to device
Green	Device operating normally
Flashing Green	Device needs commissioning due to missing, incomplete, or incorrect configuration
Flashing Red	Recoverable fault
Red	Unrecoverable fault - may require device replacement
Flashing Red/Green	Device is in self-test

Indication	Probable Cause
Network Status	
Off	Device is not on line: - Device has not completed dup_MAC-id test. - Device not powered - check module status indicator.
Flashing Green	Device is on line but has no connections in the established state.
Green	Device is on line and has connections in the established state.
Flashing Red	One or more I/O connections in timed-out state.
Red	Critical link failure - failed communication device. Device detected error that prevents it from communicating on the network.
Flashing Red/Green	Communication faulted device - the device has detected a network access error and is in communication faulted state. Device has received and accepted an Identity Communication Faulted Request - long protocol message.

Indication	Probable Cause
I/O Status	
Off	Input is in the off state
Yellow	Input on

Specifications - Following are specifications for the digital input modules.

Digital Input Modules	
Inputs per Module	RPSSN8M - 8 (1 group of 8) nonisolated, sinking RPSSP8M - 8 (1 group of 8) nonisolated, sourcing
Voltage, Off-State Input, Maximum	5VDC
Voltage, On-State Input, Maximum Minimum Nominal	 28.8VDC 10VDC 24VDC
Current, Off-State Input, Maximum	1.5 mA
Current, On-State Input, Maximum Minimum Nominal	 5 mA 2 mA 4 mA @ 24VDC
Input Impedance, Maximum Nominal	 4.7 kΩ 3.6 kΩ
Input Delay Time OFF to ON	0.5 ms hardware + (0-63 ms selectable[1])
Input Delay Time, ON to OFF	0.5 ms hardware + (0-63 ms selectable[1])
Input Point Density	2, 4, or 8
Field Power Bus Supply Voltage Range Nominal	 10 to 28.8VDC 24VDC
Keyswitch Position	1
LED Indicators	2, 4, or 8 yellow input status, logic side 1 green/red network status, logic side 1 green/red module status, logic side
Point Bus Current, Maximum	75 mA @ 5VDC
Power Dissipation, Maximum	RPSSN8M - 1.6W @ 28.8VDC
Thermal Dissipation, Maximum	RPSSN8M - 5.5 BTU/hr. @ 28.8VDC
Isolation Voltage (continuous-voltage withstand rating)	50V rms Tested at 1250VAC rms for 60s
Dimensions Imperial (Metric)	1.25H x 2.63W x 4.25D (31.75H x 66.80W x 107.95D)
Operating Temperature	IEC 60068-2-1 (Test Ad, Operating Cold), IEC 60068-2-2 (Test Bd, Operating Dry Heat), IEC 60068-2-14 (Test Nb, Operating Thermal Shock): -20 to 60°C (-4 to 140°F)
Storage Temperature	IEC 60068-2-1 (Test Ab, Un-packaged Non-operating Cold), IEC 60068-2-2 (Test Bb, Un-packaged Non-operating Dry Heat), -40 to 85°C (-40 to 185°F)
Relative Humidity	IEC 60068-2-30 (Test Db, Un-packaged Non-operating Damp Heat): 5 to 95% non-condensing
Shock	IEC60068-2-27 (Test Ea, Unpackaged Shock): Operating 30g Non-operating 50g
Vibration	IEC60068-2-6 (Test Fc, Operating): 5g @ 10 to 500Hz
ESD Immunity	IEC 61000-4-2: 6kV contact discharges 8kV air discharges
Radiated RF Immunity	IEC 61000-4-3: 10V/m with 1kHz sine-wave 80%AM from 30MHz to 2000MHz 10V/m with 200Hz 50% Pulse 100%AM at 900Mhz 10V/m with 200Hz 50% Pulse 100%AM at 1890Mhz
EFT/B Immunity	IEC 61000-4-4: ±3kV at 5kHz on signal ports
Surge Transient Immunity	IEC 61000-4-5: ±1kV line-line(DM) and ±2kV line-earth(CM) on signal ports
Conducted RF Immunity	IEC 61000-4-6: 10Vrms with 1kHz sine-wave 80%AM from 150kHz to 80MHz
Emissions	CSPR 11: Group 1, Class A
Enclosure Type Rating	Meets IP65/66/67 (when marked)
Mounting Base Screw Torque	#8 screw, 7.5 in. lbs. in Aluminum, 16 in. lbs. in Steel
Weight Imperial (Metric)	0.64 lb. (0.29 kg)
Wiring Category[2]	1 - on signal ports
Certifications: (when product is marked)	c-UL-us UL Listed Industrial Control Equipment, certified for US and Canada
	CE European Union 89/336/EEC EMC Directive, compliant with: EN 61000-6-4; Industrial Emissions EN 50082-2; Industrial Immunity EN 61326; Meas./Control/Lab., Industrial Requirements EN 61000-6-2; Industrial Immunity
	C- Tick Australian Radiocommunications Act, compliant with: AS/NZS CISPR 11; Industrial Emissions

1. Input OFF to ON or ON to OFF delay is time from a valid input signal to recognition by the module.
2. Use this Conductor Category information for planning conductor routing. Refer to Publication A10324, “Industrial Automation Wiring and Grounding Guidelines”.

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Installation & Service Instructions
A10319

Serial Bus 24 VDC Output Modules, Series A (RPSST8M23A, RPSST8M12A, RPSST8M8A)

ISSUED: August, 2007
Supersedes: None

⚠ WARNING

To avoid unpredictable system behavior that can cause personal injury and property damage:

- **Disconnect electrical supply (when necessary) before installation, servicing, or conversion.**
- **Disconnect air supply and depressurize all air lines connected to this product before installation, servicing, or conversion.**
- **Operate within the manufacturer's specified pressure, temperature, and other conditions listed in these instructions.**
- **Medium must be moisture-free if ambient temperature is below freezing.**
- **Service according to procedures listed in these instructions.**
- **Installation, service, and conversion of these products must be performed by knowledgeable personnel who understand how pneumatic products are to be applied.**
- **After installation, servicing, or conversion, air and electrical supplies (when necessary) should be connected and the product tested for proper function and leakage. If audible leakage is present, or the product does not operate properly, do not put into use.**
- **Warnings and specifications on the product should not be covered by paint, etc. If masking is not possible, contact your local representative for replacement labels.**

Safety Guide

For more complete information on recommended application guidelines, see the Installation Safety Guidelines section of Bulletin 600 (Form A10309) or you can download the Installation Safety Guidelines at: www.rosscontrols.com/rosslit.htm.

Introduction

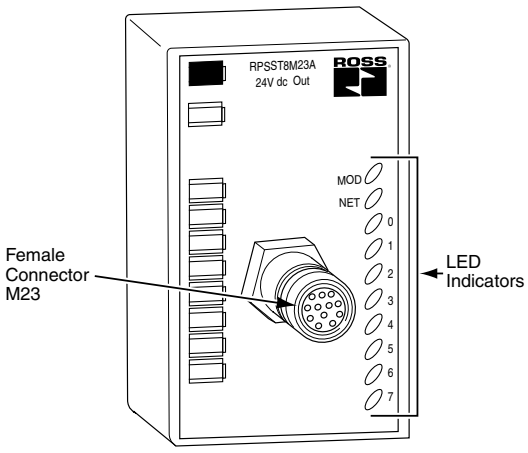
Follow these instructions when installing, operating, or servicing the product.

Serial Bus 24 VDC Output Modules, Series A

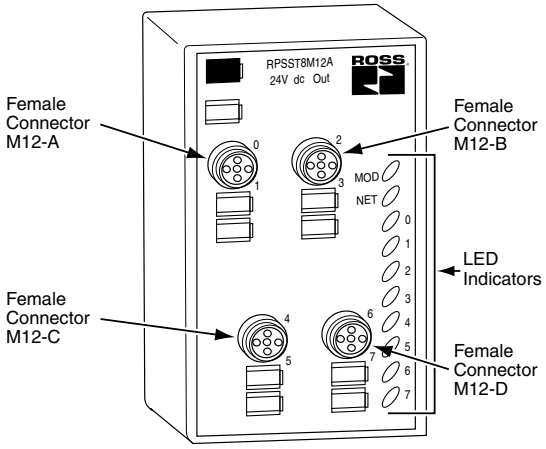
(RPSST8M23A, RPSST8M12A, RPSST8M8A)

The sealed IP67 housing of these modules requires no enclosure. (Note that environmental requirements other than IP67 may require an additional appropriate housing.) I/O connectors are sealed M8 (pico) or M12 (micro) or M23 styles. The mounting base ships with the module. The RPSST8M23A, RPSST8M12A, and RPSST8M8A modules are shown below.

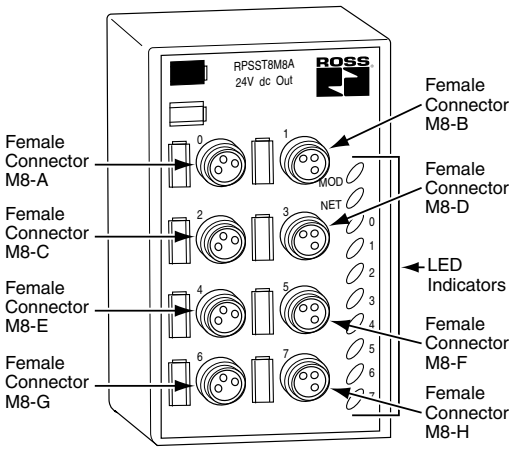
RPSST8M23A



RPSST8M12A



RPSST8M8A



⚠ WARNING

FAILURE OR IMPROPER SELECTION OR IMPROPER USE OF THE PRODUCTS AND/OR SYSTEMS DESCRIBED HEREIN OR RELATED ITEMS CAN CAUSE DEATH, PERSONAL INJURY AND PROPERTY DAMAGE.

This document and other information from ROSS CONTROLS, its subsidiaries and authorized distributors provide product and/or system options for further investigation by users having technical expertise. It is important that you analyze all aspects of your application, including consequences of any failure and review the information concerning the product or systems in the current product catalog. Due to the variety of operating conditions and applications for these products or systems, the user, through its own analysis and testing, is solely responsible for making the final selection of the products and systems and assuring that all performance, safety and warning requirements of the application are met.

The products described herein, including without limitation, product features, specifications, designs, availability and pricing, are subject to change by ROSS CONTROLS and its subsidiaries at any time without notice.

EXTRA COPIES OF THESE INSTRUCTIONS ARE AVAILABLE FOR INCLUSION IN EQUIPMENT / MAINTENANCE MANUALS THAT UTILIZE THESE PRODUCTS. CONTACT YOUR LOCAL REPRESENTATIVE.

Important User Information

Solid state equipment has operational characteristics differing from those of electromechanical equipment. *Safety Guidelines for the Application, Installation and Maintenance of Solid State Controls (Form #A10325)* (available online at www.rosscontrols.com/rosslit.htm), describes some important differences between solid state equipment and hard-wired electromechanical devices. Because of these differences, and also because of the wide variety of uses for solid state equipment, all persons responsible for applying this equipment must satisfy themselves that each intended application of this equipment is acceptable.

In no event will ROSS CONTROLS® be responsible or liable for indirect or consequential damages to persons or property resulting from the use or application of this equipment.

The examples and diagrams in this manual are included solely for illustrative purposes. Because of the many variables and requirements associated with any particular installation, ROSS CONTROLS cannot assume responsibility or liability for actual use based on the examples and diagrams.

No patent liability is assumed by ROSS CONTROLS with respect to use of information, circuits, equipment, or software described in this manual.

Reproduction of the contents of this manual, in whole or in part, without written permission of ROSS CONTROLS is prohibited.

Throughout this manual we use notes to make you aware of safety considerations.

WARNING	Identifies information about practices or circumstances that can cause an explosion in a hazardous environment, which may lead to personal injury or death, property damage, or economic loss.
IMPORTANT	Identifies information that is critical for successful application and understanding of the product.
ATTENTION	Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss. Attentions help you: • Identify a Hazard • Avoid a Hazard • Recognize the Consequence
SHOCK HAZARD	Labels may be located on or inside the equipment to alert people that dangerous voltage may be present.
BURN HAZARD	Labels may be located on or inside the equipment to alert people that surfaces may be dangerous temperatures.

ATTENTION

Environment and Enclosure

This equipment is intended for use in overvoltage Category II applications (as defined in IEC publication 60664-1), at altitudes up to 2000 meters without derating. This equipment is considered Group 1, Class A industrial equipment according to IEC/CISPR Publication 11. Without appropriate precautions, there may be potential difficulties ensuring electromagnetic compatibility in other environments due to conducted as well as radiated disturbance. This equipment is supplied as "enclosed" equipment. It should not require additional system enclosure when used in locations consistent with the enclosure type ratings stated in the Specifications section of this publication. Subsequent sections of this publication may contain additional information regarding specific enclosure type ratings, beyond what this product provides, that are required to comply with certain product safety certifications.

NOTE: See NEMA Standards publication 250 and IEC publication 60529, as applicable, for explanations of the degrees of protection provided by different types of enclosure. Also, see the appropriate sections in this publication, as well as the publication A10324 ("Industrial Automation Wiring and Grounding Guidelines"), for additional installation requirements pertaining to this equipment.

ATTENTION

Preventing Electrostatic Discharge

This equipment is sensitive to electrostatic discharge, which can cause internal damage and affect normal operation. Follow these guidelines when you handle this equipment:

- Touch a grounded object to discharge potential static.
- Wear an approved grounding wrist strap.
- Do not touch connectors or pins on component boards.
- Do not touch circuit components inside the equipment.
- If available, use a static-safe workstation.
- When not in use, store the equipment in appropriate static-safe packaging.

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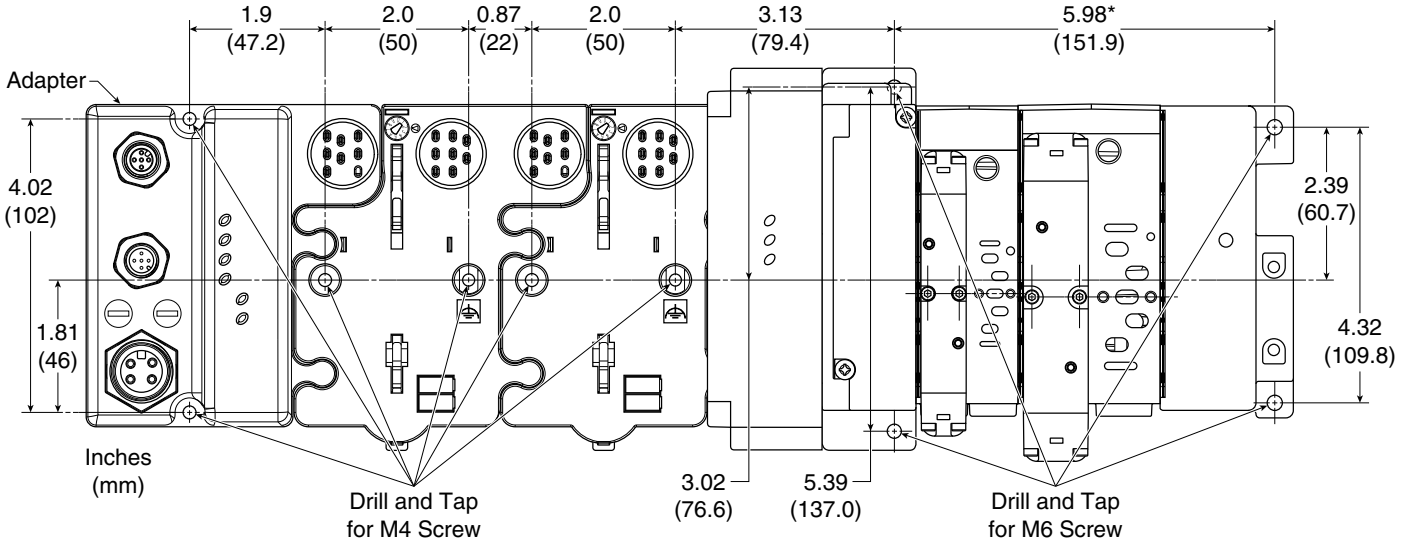
Mount the I/O Base

To mount the I/O base on a wall or panel, use the screw holes provided in the base.

IMPORTANT

The I/O module must be mounted on a grounded metal mounting plate or other conductive surface.

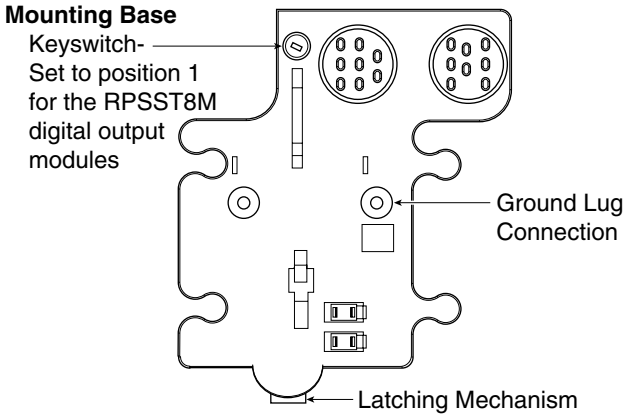
A mounting illustration for the base with an adapter is shown below.



*Depending on the type and number of manifolds, this dimension may vary. Consult Ross for specific information.

Install the Mounting Base as Follows:

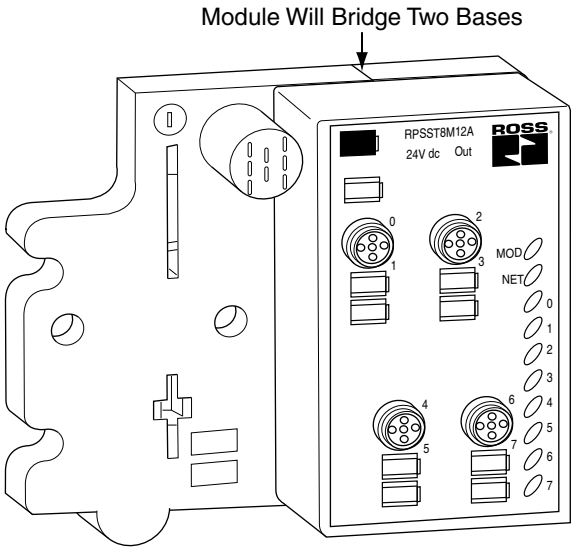
1. Lay out the required points as shown above in the drilling dimension drawing.
2. Drill the necessary holes for #8 (M4) machine or self-tapping screws.
3. Mount the base using #8 (M4) screws.
4. Ground the system using the ground lug connection. (The ground lug connection is also a mounting hole.)



Install the Digital Output Module

To Install the Digital Output Module, Proceed as Follows:

1. Using a bladed screwdriver, rotate the keyswitch on the mounting base clockwise until the number 1 aligns with the notch in the base.
2. Position the module vertically above the mounting base. The module will bridge two bases.



3. Push the module down until it engages the latching mechanism. You will hear a clicking sound when the module is properly engaged.

The locking mechanism will lock the module to the base.

Remove the Digital Output Module From the Mounting Base

To Remove the Module from the Mounting Base:

1. Put a flat blade screwdriver into the slot of the orange latching mechanism.
2. Push the screwdriver toward the I/O module to disengage the latch. The module will lift up off the base.
3. Pull the module off of the base.

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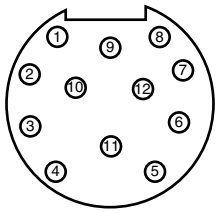
Wire the Output Modules

Following are wiring instructions for the digital output modules.

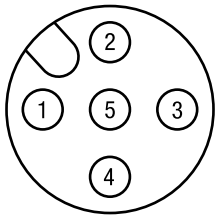
RPSST8M23A



(view into connector)

Pin 1 - Output 0
Pin 2 - Output 1
Pin 3 - Output 2
Pin 4 - Output 3
Pin 5 - Output 4
Pin 6 - Output 5
Pin 7 - Output 6
Pin 8 - Output 7
Pin 9 - Return (Com)
Pin 10 - Return (Com)
Pin 11 - 24VDC
Pin 12 - Chassis

RPSST8M12A



(view into connector)

Pin 1 - 24VDC

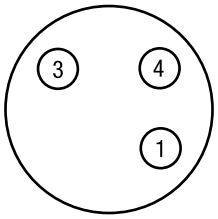
Pin 2 - Output 1 (M12-A)
Output 3 (M12-B)
Output 5 (M12-C)
Output 7 (M12-D)

Pin 3 - Common

Pin 4 - Output 0 (M12-A)
Output 2 (M12-B)
Output 4 (M12-C)
Output 6 (M12-D)

Pin 5 - No Connect

RPSST8M8A



(view into connector)

Pin 1 - 24VDC

Pin 3 - Common

Pin 4 - Output 0 (M8-A)
Output 1 (M8-B)
Output 2 (M8-C)
Output 3 (M8-D)
Output 4 (M8-E)
Output 5 (M8-F)
Output 6 (M8-G)
Output 7 (M8-H)

ATTENTION

Make sure all connectors and caps are securely tightened to properly seal the connections against leaks and maintain IP67 requirements.

Communicate With Your Module

I/O messages are sent to (consumed) and received from (produced) the I/O modules. These messages are mapped into the processor's memory. These I/O output modules produce 1 byte of input data (scanner Rx - status). They consume 1 byte of I/O data (scanner Tx).

Default Data Map for the Output Modules

RPSST8M23A, RPSST8M12A, RPSST8M8A

Message Size: 1 Byte

	7	6	5	4	3	2	1	0	
Produces (Scanner Rx)	Ch7	Ch6	Ch5	Ch4	Ch3	Ch2	Ch1	Ch0	Channel Status
Consumes (Scanner Tx)	Ch7	Ch6	Ch5	Ch4	Ch3	Ch2	Ch1	Ch0	Output State

Where: Channel Status 0 = no error, 1 = error;
Output State 0 = OFF, 1 = ON

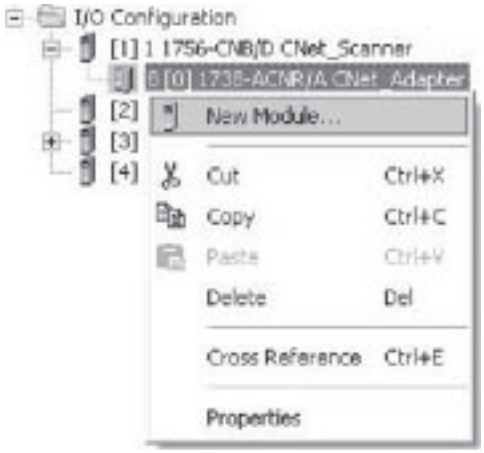
EDS File Requirements

The EDS files are available online at www.rosscontrols.com/rosslit.htm.

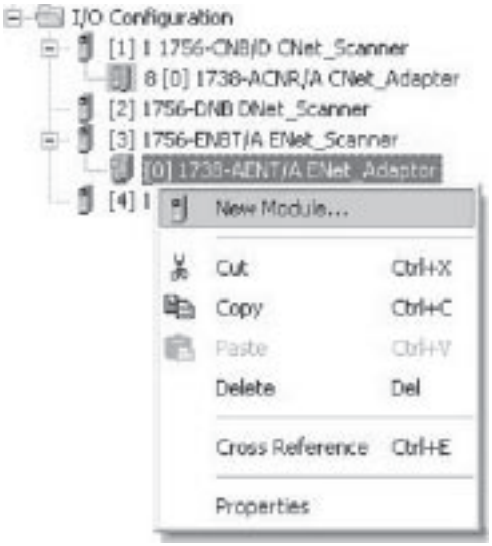
Add 24 VDC Output Modules to RSLogix 5000 I/O Configuration

To add your output modules to RSLogix 5000 I/O configuration, follow these steps:

- In RSLogix 5000:
  - For ControlNet, highlight the ***RPSSCCNA*** or ***1738-ACNR (Shown)***, right click and select ***New Module***.

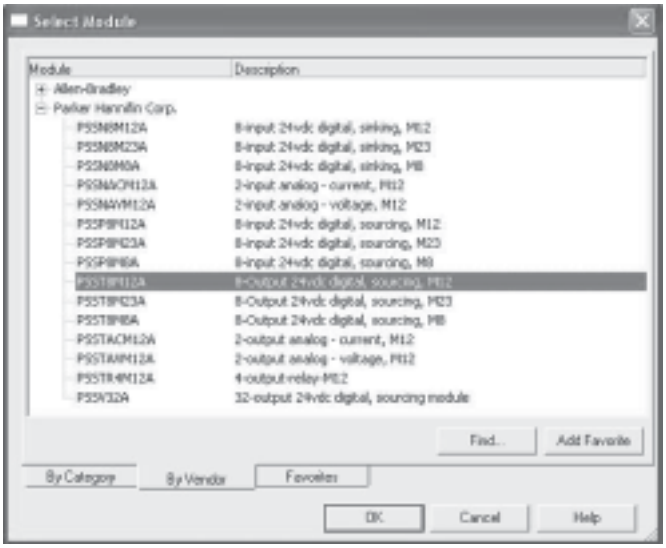


  - For EtherNet/IP, highlight the ***RPSSCENA*** or ***1738-AENT (Shown)***, right click and select ***New Module***.

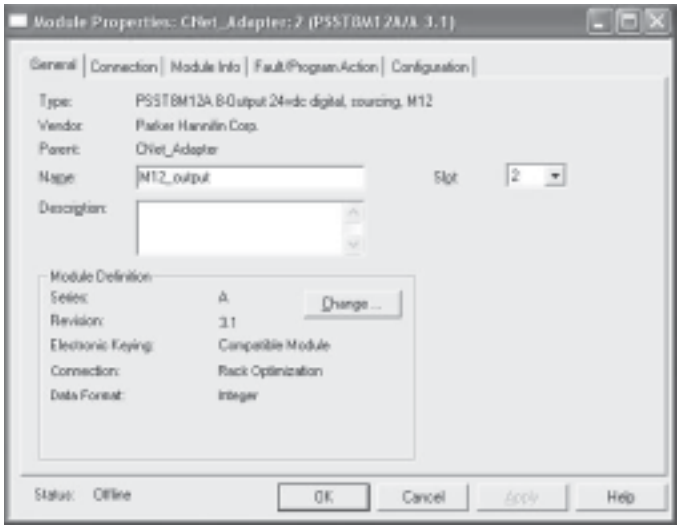


If your RSLogic 5000 is Version 15.X or greater:

- Choose the ***RPSST8M12A*** module from the list of Parker modules.



- Enter a name and click OK.



- Notice that the RPSST8M12A is now under the I/O configuration.

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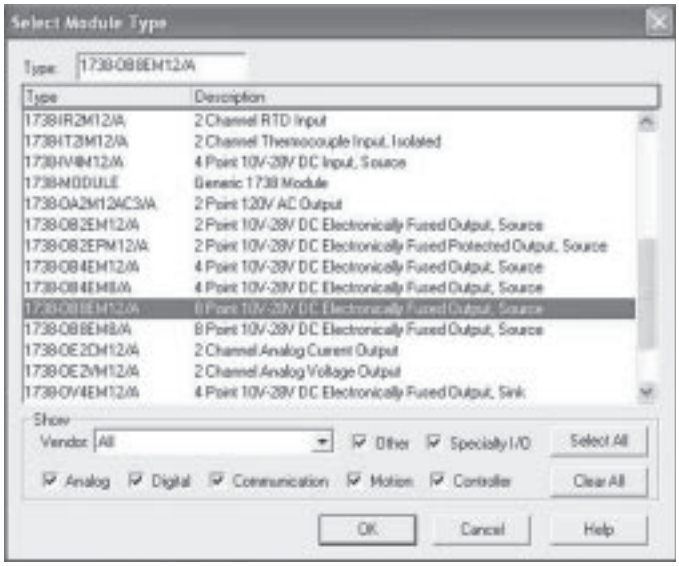
If your RSLogic 5000 is Version 13.X:

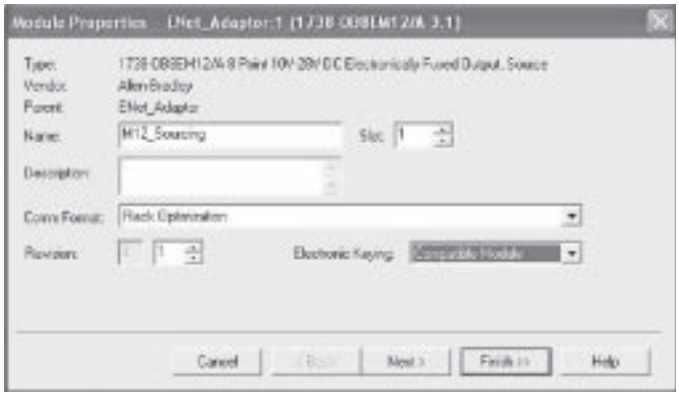
- Choose the equivalent Rockwell Automation module from the list of modules.


Select Module Type
Type: 1738-OB8EM12/A
Type
Description
1738-IR2M12/A 2 Channel RTD Input
1738-IT2M12/A 2 Channel Thermocouple Input, Isolated
1738-IV4M12/A 4 Point 10V-28V DC Input, Source
1738-MODULE Generic 1738 Module
1738-OA2M12AC3/A 2 Point 120V AC Output
1738-OB2EM12/A 2 Point 10V-28V DC Electronically Fused Output, Source
1738-OB2EPM12/A 2 Point 10V-28V DC Electronically Fused Protected Output, Source
1738-OB4EM12/A 4 Point 10V-28V DC Electronically Fused Output, Source
1738-OB4EM8/A 4 Point 10V-28V DC Electronically Fused Output, Source
1738-OB8EM12/A 8 Point 10V-28V DC Electronically Fused Output, Source
1738-OB8EM8/A 8 Point 10V-28V DC Electronically Fused Output, Source
1738-OE2CM12/A 2 Channel Analog Current Output
1738-OE2VM12/A 2 Channel Analog Voltage Output
1738-OV4EM12/A 4 Point 10V-28V DC Electronically Fused Output, Sink
Show
Vendor: All
Other
Specialty I/O
Select All
Analog
Digital
Communication
Motion
Controller
Clear All
OK
Cancel
Help

Serial Bus Modules	Equivalent Rockwell Automation 1738 ArmorPoint Modules
RPSST8M8A	1738-OB8EM8
RPSST8M12A	1738-OB8EM12
RPSST8M23A	1738-OB8EM23*

* 1738-OB8EM23 profile will be available in RSLogix 5000 v15. To use 1738-OB8EM23 in RSLogix 5000 v13, choose 1738-OB8EM12 profile and disable keying.

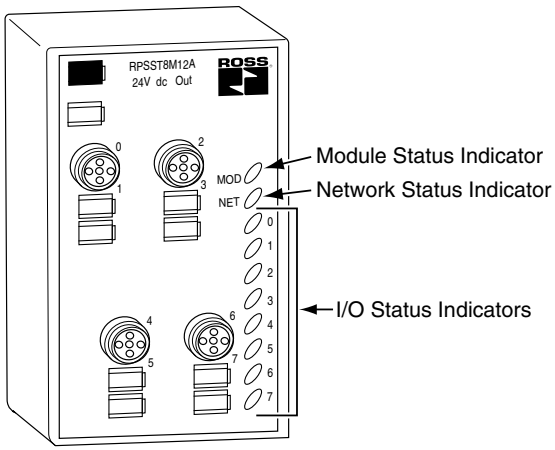
- Enter a name (optional), slot number, and communication format. Make sure to choose ***Compatible Module for Electronic Keying*** setting.



- Choose ***Next*** to set **RPI.**
- Choose ***Finish***. Notice that the output module is now under the I/O configuration

Troubleshoot With the Indicators

RPSST8M12A



Indication	Probable Cause
Module Status	
Off	No power applied to device
Green	Device operating normally
Flashing Green	Device needs commissioning due to missing, incomplete, or incorrect configuration
Flashing Red	Recoverable fault
Red	Unrecoverable fault - may require device replacement
Flashing Red/Green	Device is in self-test

Indication	Probable Cause
Network Status	
Off	Device is not on line: - Device has not completed dup_MAC-id test. - Device not powered - check module status indicator.
Flashing Green	Device is on line but has no connections in the established state.
Green	Device is on line and has connections in the established state.
Flashing Red	One or more I/O connections in timed-out state.
Red	Critical link failure - failed communication device. Device detected error that prevents it from communicating on the network.
Flashing Red/Green	Communication faulted device - the device has detected a network access error and is in communication faulted state. Device has received and accepted an Identity Communication Faulted Request - long protocol message.

Indication	Probable Cause
I/O Status	
Off	Output is inactive
Yellow	Output is active and under control
Flashing Red	Open circuit detection. No load. (Off-State only)
Red	Short circuit detected. (On-State only)

Specifications - Following are specifications for the digital output modules.

Digital Output Modules	
Outputs per Module	8 (1 group of 8) nonisolated, sourcing
Voltage Drop, On-State Output, Maximum	0.2VDC (sourcing modules) 0.7VDC (sinking module)
Voltage, Off-State Output, Maximum	28.8VDC
Voltage, On-State Output, Maximum Minimum Nominal	 28.8VDC 10VDC 24VDC
Current Leakage, Off-State Output, Maximum	0.5 mA
Current, On-State Output Minimum	1.0 mA per channel
Output Current Rating	1.0 A per channel, not to exceed 3.0 A maximum per module
Output Delay Time OFF to ON, Maximum[1]	0.1 ms
Output Delay Time, ON to OFF, Maximum[1]	0.1 ms
Output Point Density	2, 4, 8
Output Surge Current, Maximum	2 A for 10 ms, repeatable every 3 seconds
External DC Power Supply Current	32 mA
External DC Power Supply Voltage Range	10 to 28.8VDC
External DC Power Supply Voltage Nominal	24VDC
Keyswitch Position	1
LED Indicators	2, 4, or 8 yellow/red output status, logic side 1 green/red network status, logic side 1 green/red module status, logic side
PointBus Current, Maximum	75 mA @ 5VDC
Power Dissipation, Maximum	RPSST8M - 2.0W @ 28.8VDC
Thermal Dissipation, Maximum	RPSST8M - 6.8 BTU/hr. @ 28.8VDC
Isolation Voltage (continuous-voltage withstand rating)	50V rms Tested at 1250VAC rms for 60s
Dimensions (includes I/O module and mounting base) Inches (Millimeters)	4.72H x 2.82W x 1.65D (120H x 72W x 42D)
Operating Temperature	IEC 60068-2-1 (Test Ad, Operating Cold), IEC 60068-2-2 (Test Bd, Operating Dry Heat), IEC 60068-2-14 (Test Nb, Operating Thermal Shock): -20 to 60°C (-4 to 140°F)
Storage Temperature	IEC 60068-2-1 (Test Ab, Un-packaged Non-operating Cold), IEC 60068-2-2 (Test Bb, Un-packaged Non-operating Dry Heat), -40 to 85°C (-40 to 185°F)
Relative Humidity	IEC 60068-2-30 (Test Db, Un-packaged Non-operating Damp Heat): 5 to 95% non-condensing
Shock	IEC60068-2-27 (Test Ea, Unpackaged Shock): Operating 30g Non-operating 50g
Vibration	IEC60068-2-6 (Test Fc, Operating): 5g @ 10 to 500Hz
ESD Immunity	IEC 61000-4-2: 6kV contact discharges 8kV air discharges
Radiated RF Immunity	IEC 61000-4-3: 10V/m with 1kHz sine-wave 80%AM from 30MHz to 2000MHz 10V/m with 200Hz 50% Pulse 100%AM at 900Mhz 10V/m with 200Hz 50% Pulse 100%AM at 1890Mhz
EFT/B Immunity	IEC 61000-4-4: ±3kV at 5kHz on signal ports
Surge Transient Immunity	IEC 61000-4-5: ±1kV line-line(DM) and ±2kV line-earth(CM) on signal ports
Conducted RF Immunity	IEC 61000-4-6: 10Vrms with 1kHz sine-wave 80%AM from 150kHz to 80MHz
Emissions	CSPR 11: Group 1, Class A
Enclosure Type Rating	Meets IP65/66/67 (when marked)
Mounting Base Screw Torque	#8 screw, 7.5 in. lbs. in Aluminum, 16 in. lbs. in Steel
Wiring Category[2]	1 - on signal ports
Weight Imperial (Metric)	0.64 lb. (0.29 kg)
Certifications: (when product is marked)	c-UL-us UL Listed Industrial Control Equipment, certified for US and Canada CE European Union 89/336/EEC EMC Directive, compliant with: EN 61000-6-4; Industrial Emissions EN 50082-2; Industrial Immunity EN 61326; Meas./Control/Lab., Industrial Requirements EN 61000-6-2; Industrial Immunity C- Tick Australian Radiocommunications Act, compliant with: AS/NZS CISPR 11; Industrial Emissions

1. OFF to ON or ON to OFF delay is time from a valid output “on” or “off” signal to output energization or de-energization.
2. Use this Conductor Category information for planning conductor routing. Refer to Publication A10324, “Industrial Automation Wiring and Grounding Guidelines”.

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Installation & Service Instructions
A10312

Serial Bus 32 Point Valve Driver, Series A (RPSSV32A)

ISSUED: August, 2007
Supersedes: None

⚠WARNING

To avoid unpredictable system behavior that can cause personal injury and property damage:

- **Disconnect electrical supply (when necessary) before installation, servicing, or conversion.**
- **Disconnect air supply and depressurize all air lines connected to this product before installation, servicing, or conversion.**
- **Operate within the manufacturer's specified pressure, temperature, and other conditions listed in these instructions.**
- **Medium must be moisture-free if ambient temperature is below freezing.**
- **Service according to procedures listed in these instructions.**
- **Installation, service, and conversion of these products must be performed by knowledgeable personnel who understand how pneumatic products are to be applied.**
- **After installation, servicing, or conversion, air and electrical supplies (when necessary) should be connected and the product tested for proper function and leakage. If audible leakage is present, or the product does not operate properly, do not put into use.**
- **Warnings and specifications on the product should not be covered by paint, etc. If masking is not possible, contact your local representative for replacement labels.**

Safety Guide

For more complete information on recommended application guidelines, see the Installation Safety Guidelines section of Bulletin 600 (Form A10309) or you can download the Installation Safety Guidelines at: www.rosscontrols.com/rosslit.htm.

Introduction

Follow these instructions when installing, operating, or servicing the product.

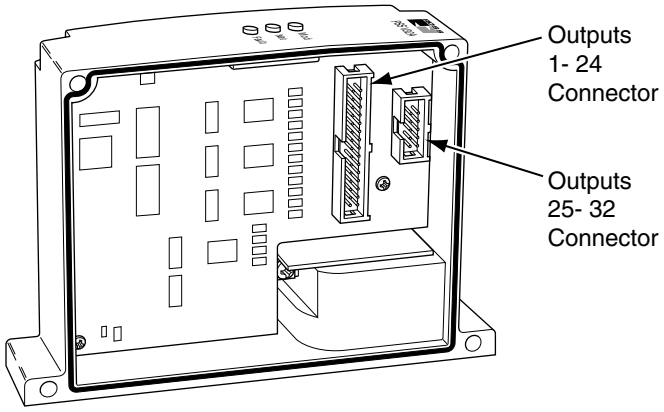
Serial Bus 32 Point Valve Driver, Series A

(RPSSV32A)

The sealed IP67 housing of these modules requires no enclosure. (Note that environmental requirements other than IP67 may require an additional appropriate housing.) The RPSSV32A module is shown below.

The RPSSV32A valve driver module provides an interface between the serial bus system and the valve assembly. This module will always be the last module on the serial bus. It controls 32 digital outputs at 24VDC. Depending on valve selection, it can control up to 32 single solenoid valves or 16 double solenoid valves.

RPSSV32A



⚠ WARNING

FAILURE OR IMPROPER SELECTION OR IMPROPER USE OF THE PRODUCTS AND/OR SYSTEMS DESCRIBED HEREIN OR RELATED ITEMS CAN CAUSE DEATH, PERSONAL INJURY AND PROPERTY DAMAGE.

This document and other information from ROSS CONTROLS, its subsidiaries and authorized distributors provide product and/or system options for further investigation by users having technical expertise. It is important that you analyze all aspects of your application, including consequences of any failure and review the information concerning the product or systems in the current product catalog. Due to the variety of operating conditions and applications for these products or systems, the user, through its own analysis and testing, is solely responsible for making the final selection of the products and systems and assuring that all performance, safety and warning requirements of the application are met.

The products described herein, including without limitation, product features, specifications, designs, availability and pricing, are subject to change by ROSS CONTROLS and its subsidiaries at any time without notice.

EXTRA COPIES OF THESE INSTRUCTIONS ARE AVAILABLE FOR INCLUSION IN EQUIPMENT / MAINTENANCE MANUALS THAT UTILIZE THESE PRODUCTS. CONTACT YOUR LOCAL REPRESENTATIVE.

Important User Information

Solid state equipment has operational characteristics differing from those of electromechanical equipment. *Safety Guidelines for the Application, Installation and Maintenance of Solid State Controls (Form #A10325)* (available online at www.rosscontrols.com/rosslit.htm), describes some important differences between solid state equipment and hard-wired electromechanical devices. Because of these differences, and also because of the wide variety of uses for solid state equipment, all persons responsible for applying this equipment must satisfy themselves that each intended application of this equipment is acceptable.

In no event will ROSS CONTROLS® be responsible or liable for indirect or consequential damages to persons or property resulting from the use or application of this equipment.

The examples and diagrams in this manual are included solely for illustrative purposes. Because of the many variables and requirements associated with any particular installation, ROSS CONTROLS cannot assume responsibility or liability for actual use based on the examples and diagrams.

No patent liability is assumed by ROSS CONTROLS with respect to use of information, circuits, equipment, or software described in this manual.

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Throughout this manual we use notes to make you aware of safety considerations.

WARNING	Identifies information about practices or circumstances that can cause an explosion in a hazardous environment, which may lead to personal injury or death, property damage, or economic loss.
IMPORTANT	Identifies information that is critical for successful application and understanding of the product.
ATTENTION	Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss. Attentions help you: • Identify a Hazard • Avoid a Hazard • Recognize the Consequence
SHOCK HAZARD	Labels may be located on or inside the equipment to alert people that dangerous voltage may be present.
BURN HAZARD	Labels may be located on or inside the equipment to alert people that surfaces may be dangerous temperatures.

ATTENTION

Environment and Enclosure

This equipment is intended for use in overvoltage Category II applications (as defined in IEC publication 60664-1), at altitudes up to 2000 meters without derating. This equipment is considered Group 1, Class A industrial equipment according to IEC/CISPR Publication 11. Without appropriate precautions, there may be potential difficulties ensuring electromagnetic compatibility in other environments due to conducted as well as radiated disturbance. This equipment is supplied as “enclosed” equipment. It should not require additional system enclosure when used in locations consistent with the enclosure type ratings stated in the Specifications section of this publication. Subsequent sections of this publication may contain additional information regarding specific enclosure type ratings, beyond what this product provides, that are required to comply with certain product safety certifications.

NOTE: See NEMA Standards publication 250 and IEC publication 60529, as applicable, for explanations of the degrees of protection provided by different types of enclosure. Also, see the appropriate sections in this publication, as well as the publication A10324 (“Industrial Automation Wiring and Grounding Guidelines”), for additional installation requirements pertaining to this equipment.

ATTENTION

Preventing Electrostatic Discharge

This equipment is sensitive to electrostatic discharge, which can cause internal damage and affect normal operation. Follow these guidelines when you handle this equipment:

- Touch a grounded object to discharge potential static.
- Wear an approved grounding wrist strap.
- Do not touch connectors or pins on component boards.
- Do not touch circuit components inside the equipment.
- If available, use a static-safe workstation.
- When not in use, store the equipment in appropriate static-safe packaging.

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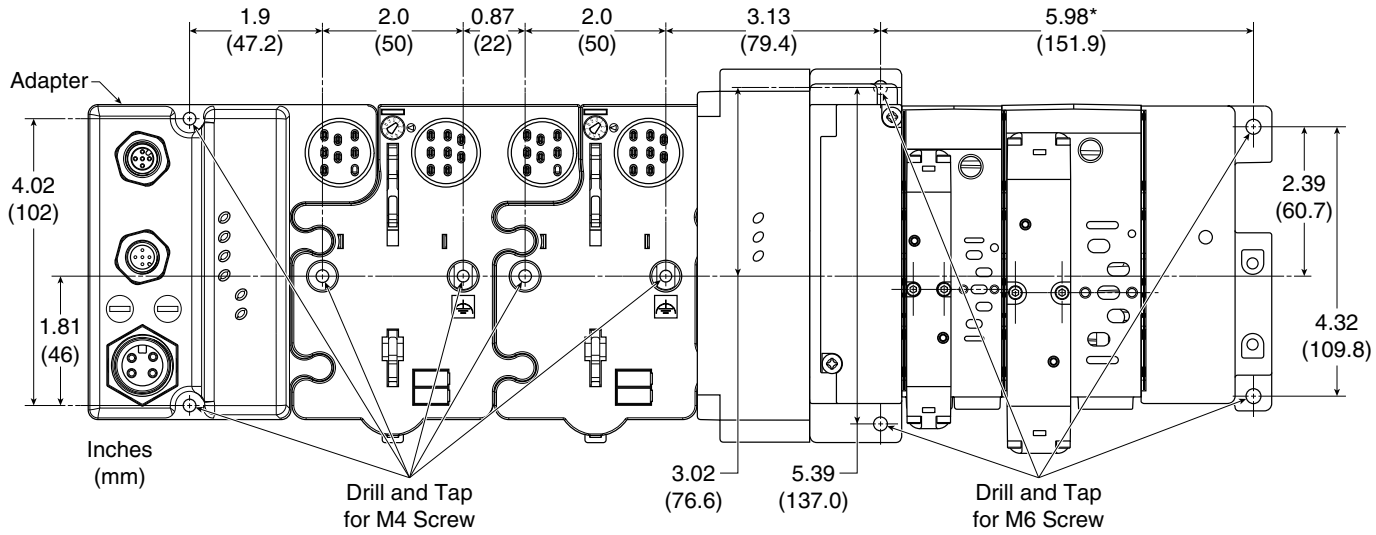
Mount the I/O Base

To mount the I/O base on a wall or panel, use the screw holes provided in the base.

IMPORTANT

The I/O module must be mounted on a grounded metal mounting plate or other conductive surface.

A mounting illustration for the base with an adapter is shown below.

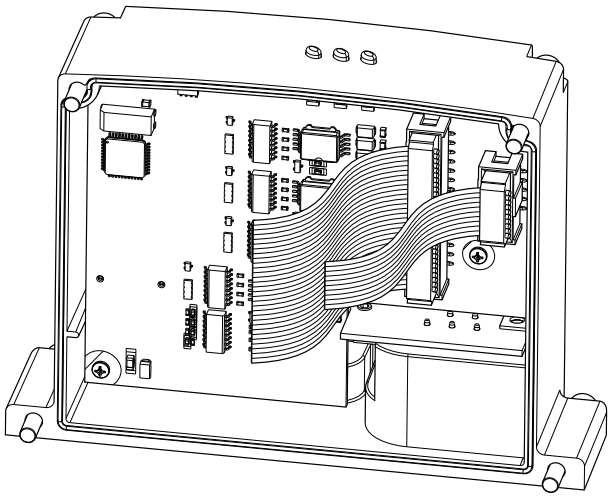


* Depending on the type and number of manifolds, this dimension may vary. Consult Ross for specific information.

Install the 32 Point Valve Driver

To Install the 32 Point Valve Driver, Proceed as Follows:

1. Assemble the valve driver to the manifold interface plate using four M4 screws, torqued 11 to 13 in. lbs.
2. Plug the 32 point valve driver onto the previous mounting base or communication adapter.



Wire the 32 Point Valve Driver

Following are wiring instructions for the 32 point valve driver.

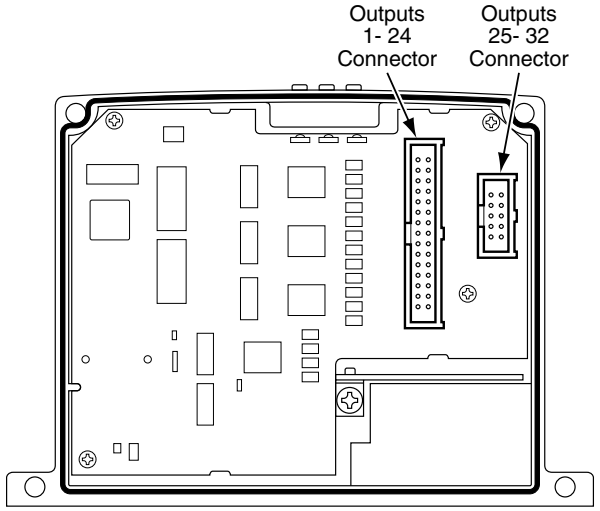
Use the appropriate harness assembly based on your manifold wiring/interconnect system.

Harness Assembly Kit Numbers

	1 to 24 Outputs	25 to 32 Outputs
Series W66, Size 0	RPS5624P	RPS5632P
Series W66, Size 00		
Series W65, Size 1	RPS4024P	RPS4032P
Series W65, Size 2		
Series W65, Size 3		

Plug the 2X15 connector into the valve driver module for 1-24 outputs. If you have more than 24 outputs, plug the 2X5 connector into the valve driver module for 25-32 outputs.

Plug the 2X10 and 1X10 connectors into the interconnect board in the valve manifold.



EDS File Requirements

The EDS file is available online at www.rosscontrols.com/rosslit.htm

ATTENTION

Make sure all four screws are securely tightened to properly seal the connections against leaks and maintain IP67 requirements.

Communicate With Your Module

I/O messages are sent to (consumed) and received from (produced) the I/O modules. These messages are mapped into the processor's memory. The 32 point valve driver produces 1 byte of input data (scanner Rx - status), and consumes 1 byte of I/O data (scanner Tx).

Default Data Map for the 32 Point Valve Driver

RPSSV32A

Message Size: 1 Byte

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Produce 0	Output 7	Output 6	Output 5	Output 4	Output 3	Output 2	Output 1	Output 0
Produce 1	Output 15	Output 14	Output 13	Output 12	Output 11	Output 10	Output 9	Output 8
Produce 2	Output 23	Output 22	Output 21	Output 20	Output 19	Output 18	Output 17	Output 16
Produce 3	Output 31	Output 30	Output 29	Output 28	Output 27	Output 26	Output 25	Output 24
Produce 4	Fault 28-31	Fault 24-27	Fault 20-23	Fault 16-19	Fault 12-15	Fault 8-11	Fault 4-7	Fault 0-3
Consume 0	Output 7	Output 6	Output 5	Output 4	Output 3	Output 2	Output 1	Output 0
Consume 1	Output 15	Output 14	Output 13	Output 12	Output 11	Output 10	Output 9	Output 8
Consume 2	Output 23	Output 22	Output 21	Output 20	Output 19	Output 18	Output 17	Output 16
Consume 3	Output 31	Output 30	Output 29	Output 28	Output 27	Output 26	Output 25	Output 24

Setup the 32 Point Valve Driver in DeviceNet

Step 1: Load 32 Point Valve Driver EDS file to RSLinx

- Download EDS file from www.rosscontrols.com/rosslit.htm
- On your computer, follow **Start→Rockwell Software→RSLinx Tools→EDS Hardware Installation Tool** to load the EDS file to RSLinx

Step 2: Configure the DeviceNet Scanner Subnet

- Reference Chapter 4 of the Serial Bus DeviceNet Adapters User Manual Bulletin 601 (Form #A10311) for detailed information. Make sure to add RPSSV32A to the DeviceNet Adapter's scanlist.

Step 3: Add the Serial Bus DeviceNet Adapter to the DeviceNet Scanner's Scanlist

- Reference Chapter 5 of the Serial Bus DeviceNet Adapters User Manual Bulletin 601 (Form #A10311) for detailed information.

Step 4: Use 32 Point Valve Driver in RSLogix 5000

- Access RPSSV32A data via DeviceNet Scanner in the ladder logic program.

Setup the 32 Point Valve Driver in ControlNet

Step 1: Load 32 Point Valve Driver EDS file to RSLinx

- Download EDS file from www.rosscontrols.com/rosslit.htm
- On your computer, follow **Start→Rockwell Software→RSLinx Tools→EDS Hardware Installation Tool** to load the EDS file to RSLinx

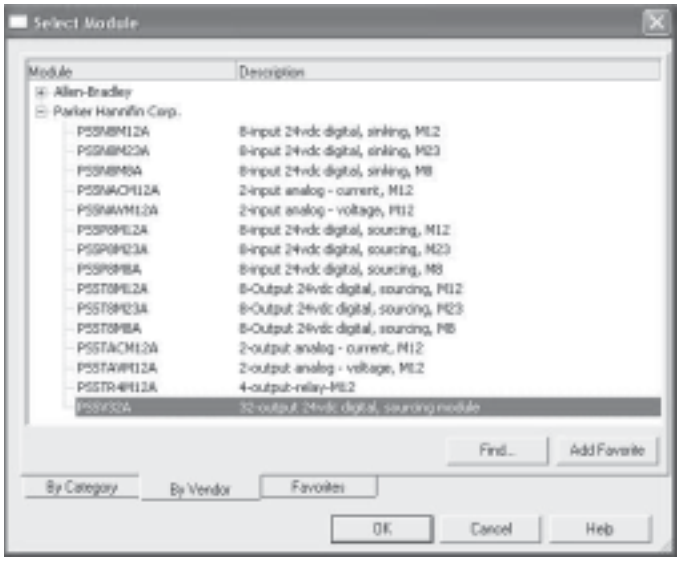
Step 2: Add Controller and Communication Module to the RSLogix 5000 I/O Configuration

- Add a controller and a communication module (Serial Bus RPSSCCNA or Rockwell 1738-ACNR) to I/O configuration. Reference pages 4-1 through 4-7 of Rockwell publication 1734-UM008 (follow **www.rockwell.com→Support→Support Overview→Online manuals and literature→I/O→1734 POINT and 1734D POINT Block I/O** and find POINT I/O ControlNet Adapter User Manual) for a similar setup procedure.

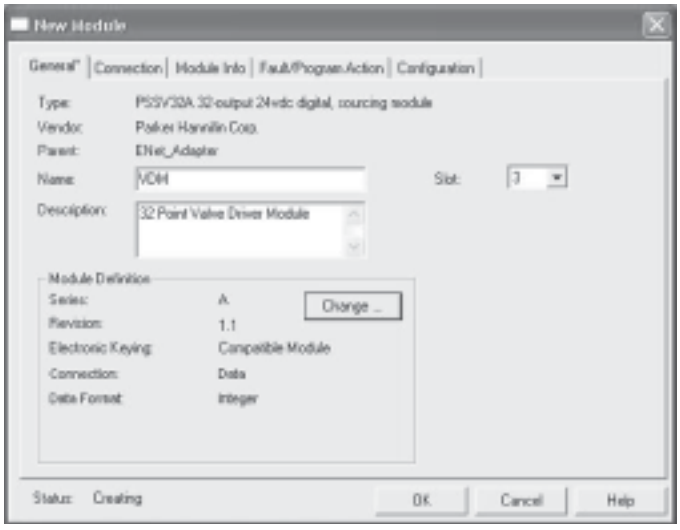
Step 3: Add 32 Point Valve Driver to RSLogix 5000 I/O Configuration.

If your RSLogic 5000 is Version 15.X or greater:

- Highlight the ***RPSSCCNA*** under I/O configuration, right click and select **New Module**.
- Choose the ***RPSSV32A*** module from the list of Parker modules.



- Enter a name (optional) and click OK.



Notice that the ***32 Point Valve Drive Module*** is now under I/O Configuration.

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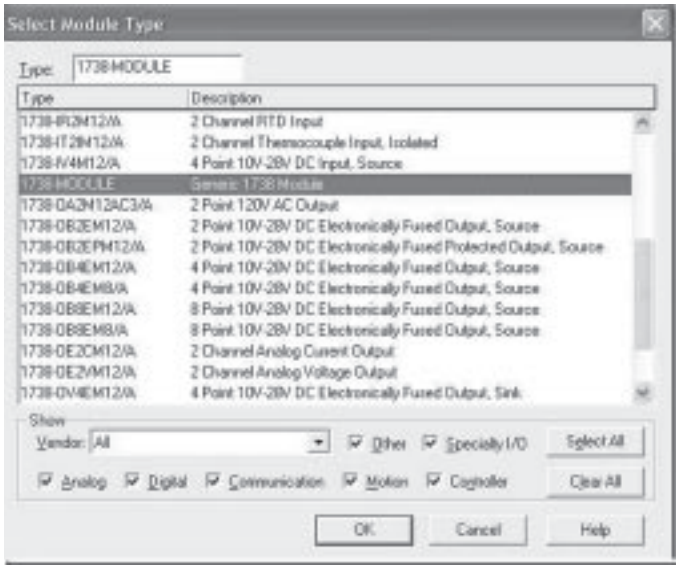
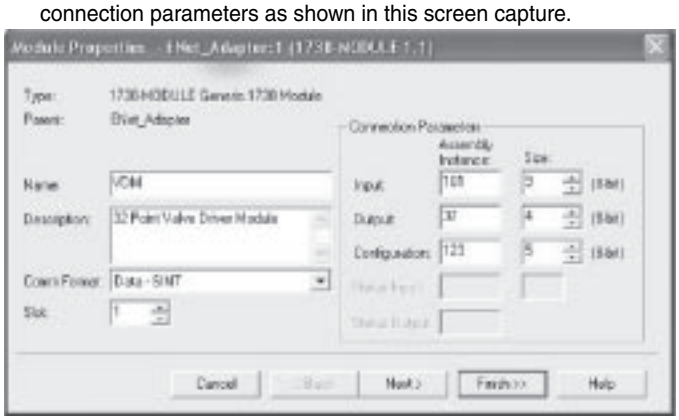
If your RSLogic 5000 is Version 13.X:

- Highlight the ***1738-ACNR*** under I/O configuration, right click and select **New Module**.
- Choose the ***Generic 1738*** module from the list of Allen-Bradley modules.



- Enter a name (optional), an appropriate slot number and the connection parameters as shown in this screen capture.



- Choose ***Next*** to set **RPI.**
- Choose ***Finish***. Notice that the 32 Point Valve Driver Module is now under the I/O configuration.

Step 4: Download the Program to the Controller and Configure the RPSSCCNA or 1738-ACNR Adapter.

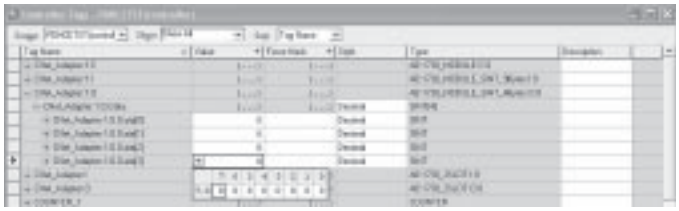
- Reference pages 4-11 through 4-15 of Rockwell publication 1734-UM008 for similar setup procedure.

Step 5: Schedule I/O Module Connections

- Reference pages 4-15 through 4-19 of Rockwell publication 1734-UM008 for similar setup procedure.

Step 6: Access Module Data via the RPSSCCNA or 1738-ACNR Adapter.

- Make sure the 32 outputs of RPSSV32A appear in Controller Tags. Use the information in the ladder logic program to access module data.



- Reference pages 4-19 through 4-22 of Rockwell publication 1734-UM008 for similar information.

Setup the 32 Point Valve Driver in EtherNet/IP

Step 1: Load 32 Point Valve Driver EDS file to RSLinx

- Download EDS file from www.rosscontrols.com/rosslit.htm
- On your computer, follow **Start→Rockwell Software→RSLinx Tools→EDS Hardware Installation Tool** to load the EDS file to RSLinx

Step 2: Set IP Address for EtherNet/IP Scanner and Adapter

- Set IP address using Rockwell BootP/DHCP utility for EtherNet/IP scanner and PSSCENA or 1738-AENT adapter. Reference pages 3-7 through 3-10 of Rockwell publication 1734-UM011 (follow **www.rockwell.com→Support→Support Overview→Online manuals and literature→I/O→1734 POINT and 1734D POINT Block I/O** and find POINT I/O Ethernet Adapter User Manual) for similar information.

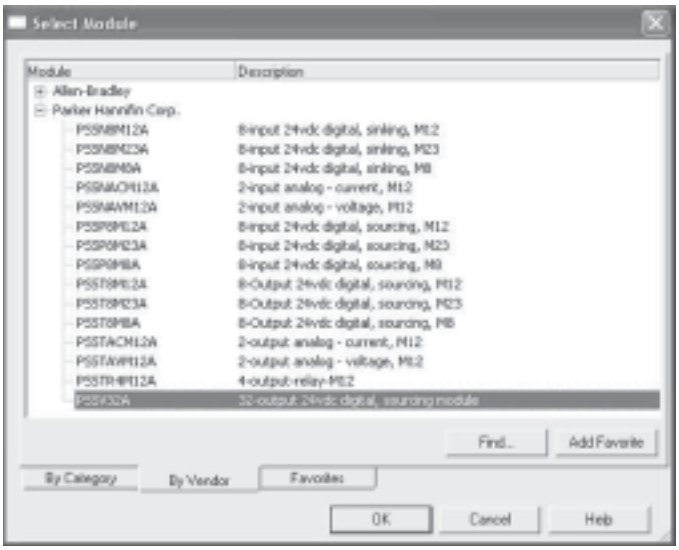
Step 3: Add EtherNet/IP Scanner and Adapter to RSLogix 5000 I/O configuration.

- Add EtherNet/IP scanner and PSSCENA or 1738-AENT adapter to I/O configuration. Reference pages 4-4 to 4-8 of Rockwell publication 1734-UM011 for similar information.

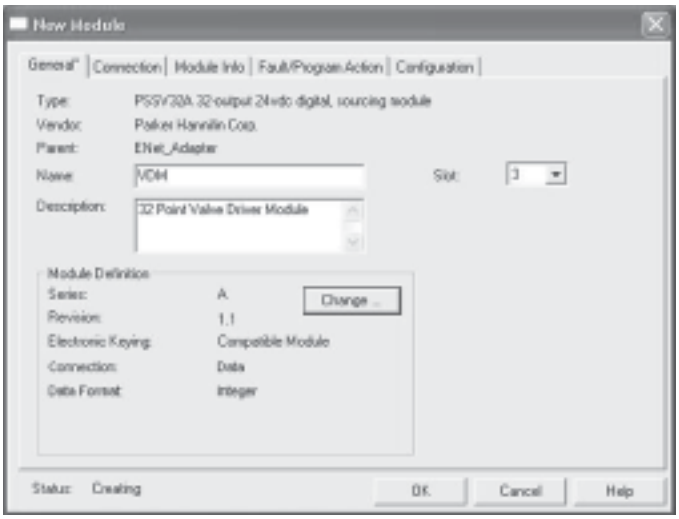
Step 4: Add 32 Point Valve Driver to RSLogix 5000 I/O Configuration.

If your RSLogic 5000 is Version 15.X or greater:

- Highlight the ***PSSCENA*** under I/O configuration, right click and select **New Module**.
- Choose the ***RPSSV32A*** module from the list of Ross modules.



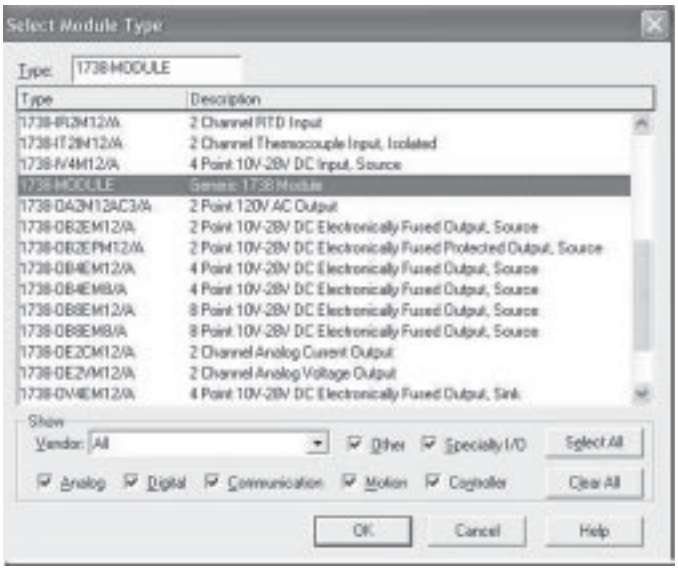
- Enter a name (optional) and click OK.



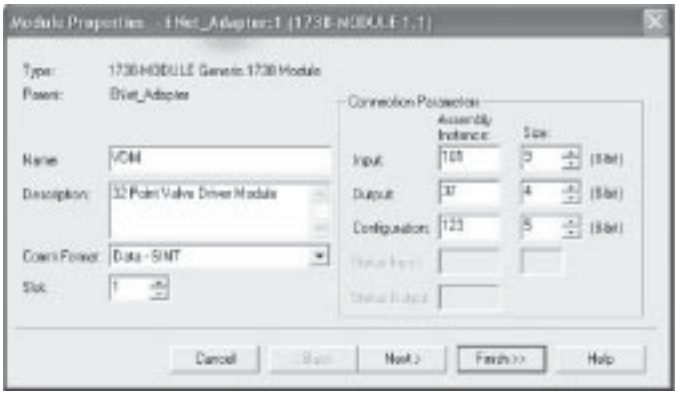
Notice that the ***32 Point Valve Drive Module*** is now under I/O Configuration.

If your RSLogic 5000 is Version 13.X:

- Highlight the ***1738-AENT*** under I/O configuration, right click and select **New Module**.
- Choose the ***Generic 1738*** module from the list of Allen-Bradley modules.



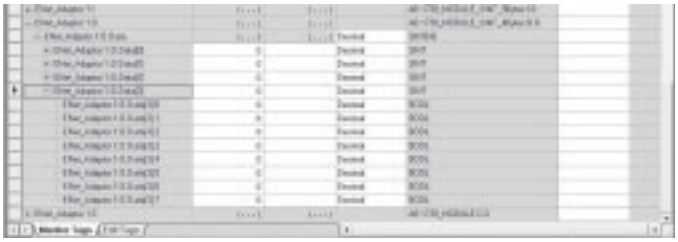
- Enter a name (optional), an appropriate slot number and the connection parameters as shown in this screen capture.



- Choose ***Next*** to set **RPI.**
- Choose ***Finish***. Notice that the 32 Point Valve Driver Module is now under the I/O configuration.

Step 5: Access Module Data via the RPSSCENA or 1738-AENT Adapter and Create Ladder Program.

- Make sure the 32 outputs of RPSSV32A appear in Controller Tags. Use the information in the ladder logic program to access module data.



- Reference pages 4-13 through 4-14 of Rockwell publication 1734-UM011 for similar information.

Step 6: Download the Program to the Controller

- Reference pages 4-13 through 4-14 of Rockwell publication 1734-UM011 for similar information.

Setup the 32 Point Valve Driver in Profibus

Step 1: Configure Valve Driver Module in SST Profibus Configuration Utility

Note: SST-PFB-CLX is used here for example. For different Profibus scanners, refer to appropriate documentation for setup information.

- Download GSD file from www.rosscontrols.com/rosslit.htm
- In SST Profibus Configuration Utility, follow **Library→Add GSD** to load the GSD file to SST Profibus.
- In SST Profibus Configuration Utility, follow **Browse→Search for devices** to load the GSD file to SST Profibus
- Right click on the found device, follow **GSD files** and click on appropriate GSD for RPSSV32A.
- Add RPSSV32A as slave to SST-PFB-CLX master.
- Detailed information can be found in the SST-PFB-CLX User Guide (Ver. 1.4 715-0022), which is available on www.woodhead.com.

Step 2: Add SST Profibus Scanner in RSLogix 5000 I/O Configuration

- Add SST-PFB-CLX scanner I/O configuration. Reference pages 36 to 39 of the SST-PFB-CLX User Guide, for detailed information.
- Notice that the SST-PFB-CLX scanner is now under the I/O configuration.

Step 3: Access Module Data via the SST-PFB-CLX Scanner and Create Ladder Program.

- Reference Chapter 7 of the SST-PFB-CLX User Guide for addressing information.

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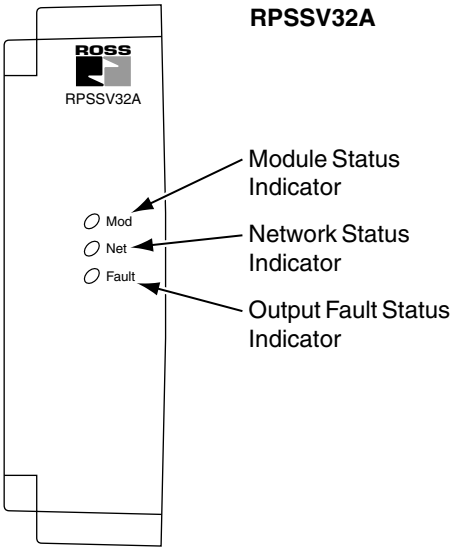
Troubleshoot With the Indicators



Indication	Probable Cause
Module Status	
Off	No power applied to device
Green	Device operating normally
Flashing Green	Device needs commissioning due to missing, incomplete, or incorrect configuration
Flashing Red	Recoverable fault
Red	Unrecoverable fault - may require device replacement
Flashing Red/Green	Device is in self-test

Indication	Probable Cause
Network Status	
Off	Device is not on line: - Device has not completed dup_MAC-id test. - Device not powered - check module status indicator.
Flashing Green	Device is on line but has no connections in the established state.
Green	Device is on line and has connections in the established state.
Flashing Red	One or more I/O connections in timed-out state.
Red	Critical link failure - failed communication device. Device detected error that prevents it from communicating on the network.
Flashing Red/Green	Communication faulted device - the device has detected a network access error and is in communication faulted state. Device has received and accepted an Identity Communication Faulted Request - long protocol message.

Indication	Probable Cause
Output Fault Status	
Off	Outputs operating normally
Red	Over current, short circuit or over temperature detected on one or more outputs. (On-State only)

Specifications – Following are specifications for the 32 point valve driver.

32 Point Valve Driver	
Outputs per Module	32, sourcing
Voltage Drop, On-State Output, Maximum	0.2VDC
Voltage, Off-State Output, Maximum	28.8VDC
Voltage, On-State Output, Maximum Minimum Nominal	 28.8VDC 10VDC 24VDC
Output Current Rating	200 mA per channel, not to exceed 6.0 A per module
Output Surge Current, Maximum	0.5 A for 10 ms, repeatable every 3 seconds
Current Leakage, Off-State Output, Maximum	0.1 mA
Current, On-State Output Minimum	200 mA per channel
Output Delay Time OFF to ON, Maximum[1]	0.1 ms
Output Delay Time, ON to OFF, Maximum[1]	0.1 ms
External DC Power Supply Voltage Range	10 to 28.8VDC
External DC Power Supply Voltage Nominal	24VDC
General Specifications	
LED Indicators	1 output status 1 green/red network status, logic side 1 green/red module status, logic side
PointBus Current, Maximum	75 mA @ 5VDC
Operating Temperature	IEC 60068-2-1 (Test Ad, Operating Cold), IEC 60068-2-2 (Test Bd, Operating Dry Heat), IEC 60068-2-14 (Test Nb, Operating Thermal Shock): -20 to 60°C (-4 to 140°F)
Storage Temperature	IEC 60068-2-1 (Test Ab, Un-packaged Non-operating Cold), IEC 60068-2-2 (Test Bb, Un-packaged Non-operating Dry Heat), -40 to 85°C (-40 to 185°F)
Relative Humidity	IEC 60068-2-30 (Test Db, Un-packaged Non-operating Damp Heat): 5 to 95% non-condensing
Shock	IEC60068-2-27 (Test Ea, Unpackaged Shock): Operating 30g Non-operating 50g
Vibration	IEC60068-2-6 (Test Fc, Operating): 5g @ 10 to 500Hz
ESD Immunity	IEC 61000-4-2: 6kV contact discharges 8kV air discharges
Radiated RF Immunity	IEC 61000-4-3: 10V/m with 1kHz sine-wave 80%AM from 30MHz to 2000MHz 10V/m with 200Hz 50% Pulse 100%AM at 900Mhz 10V/m with 200Hz 50% Pulse 100%AM at 1890Mhz
EFT/B Immunity	IEC 61000-4-4: ±3kV at 5kHz on signal ports
Surge Transient Immunity	IEC 61000-4-5: ±1kV line-line(DM) and ±2kV line-earth(CM) on signal ports
Conducted RF Immunity	IEC 61000-4-6: 10Vrms with 1kHz sine-wave 80%AM from 150kHz to 80MHz
Emissions	CSPR 11: Group 1, Class A
Enclosure Type Rating	Meets IP65/66/67 (when marked)
Mounting Base Screw Torque	#8 screw, 7.5 in. lbs. in Aluminum, 16 in. lbs. in Steel
Wiring Category[2]	1 - on signal ports
Certifications: (when product is marked)	c-UL-us UL Listed Industrial Control Equipment, certified for US and Canada CE European Union 89/336/EEC EMC Directive, compliant with: EN 61000-6-4; Industrial Emissions EN 50082-2; Industrial Immunity EN 61326; Meas./Control/Lab., Industrial Requirements EN 61000-6-2; Industrial Immunity C- Tick Australian Radiocommunications Act, compliant with: AS/NZS CISPR 11; Industrial Emissions

1. OFF to ON or ON to OFF delay is time from a valid output “on” or “off” signal to output energization or de-energization.
2. Use this Conductor Category information for planning conductor routing. Refer to Publication A10324, “Industrial Automation Wiring and Grounding Guidelines”.

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Installation & Service Instructions
A10315

Serial Bus ControlNet Adapter, Series A (RPSSCCNA)

ISSUED: August, 2007
Supersedes: None

⚠WARNING

To avoid unpredictable system behavior that can cause personal injury and property damage:

- **Disconnect electrical supply (when necessary) before installation, servicing, or conversion.**
- **Disconnect air supply and depressurize all air lines connected to this product before installation, servicing, or conversion.**
- **Operate within the manufacturer's specified pressure, temperature, and other conditions listed in these instructions.**
- **Medium must be moisture-free if ambient temperature is below freezing.**
- **Service according to procedures listed in these instructions.**
- **Installation, service, and conversion of these products must be performed by knowledgeable personnel who understand how pneumatic products are to be applied.**
- **After installation, servicing, or conversion, air and electrical supplies (when necessary) should be connected and the product tested for proper function and leakage. If audible leakage is present, or the product does not operate properly, do not put into use.**
- **Warnings and specifications on the product should not be covered by paint, etc. If masking is not possible, contact your local representative for replacement labels.**

Safety Guide

For more complete information on recommended application guidelines, see the Installation Safety Guidelines section of Bulletin 600 (Form A10309) or you can download the Installation Safety Guidelines at: www.rosscontrols.com/rosslit.htm.

Introduction

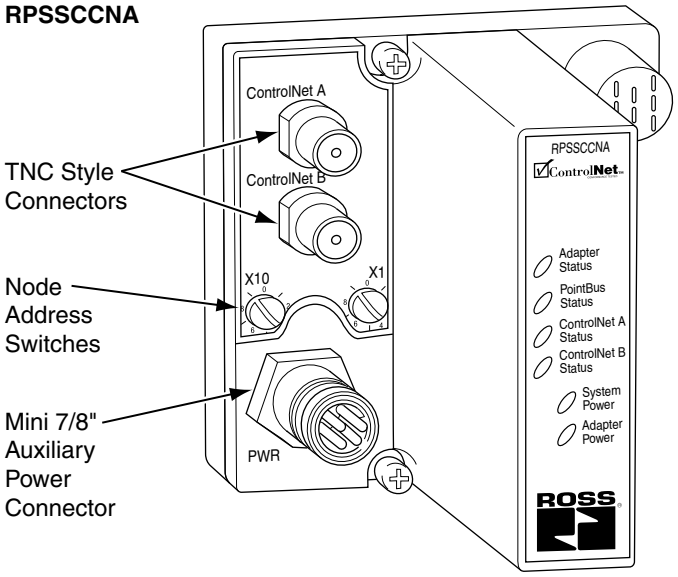
Follow these instructions when installing, operating, or servicing the product.

Serial Bus ControlNet Adapter, Series A

(RPSSCCNA)

The sealed IP67 housing of the adapter requires no enclosure. (Note that environmental requirements other than IP67 may require an additional appropriate housing.) ControlNet connectors are two redundant TNC style network connectors and one mini style power connector. The ControlNet adapter is shown below.

RPSSCCNA



Serial Bus ControlNet Adapter User Manual

The Serial Bus ControlNet Adapter User Manual PSS-UM003A-EN-P is not available at this time. Please refer to Rockwell Automation 1734 POINT I/O ControlNet Adapter User Manual 1734-UM008A-EN-P for similar setup information, which is available online at http://literature.rockwellautomation.com/.

⚠ WARNING

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Before You Begin

To effectively use your adapter, note the following considerations.

Understanding Messaging

Class 3 (Explicit Message) requests through the adapter to a specific I/O module may not always receive a response from the I/O module. In the case where the I/O module does not reply to the request, the adapter responds with an error code indicating a time-out.

Establish I/O Connections

When you power up a Serial Bus I/O system and establish I/O connections, the outputs transition to the Idle state, applying Idle state data before going to RUN mode. This occurs even when the controller making the connection is already in RUN mode.

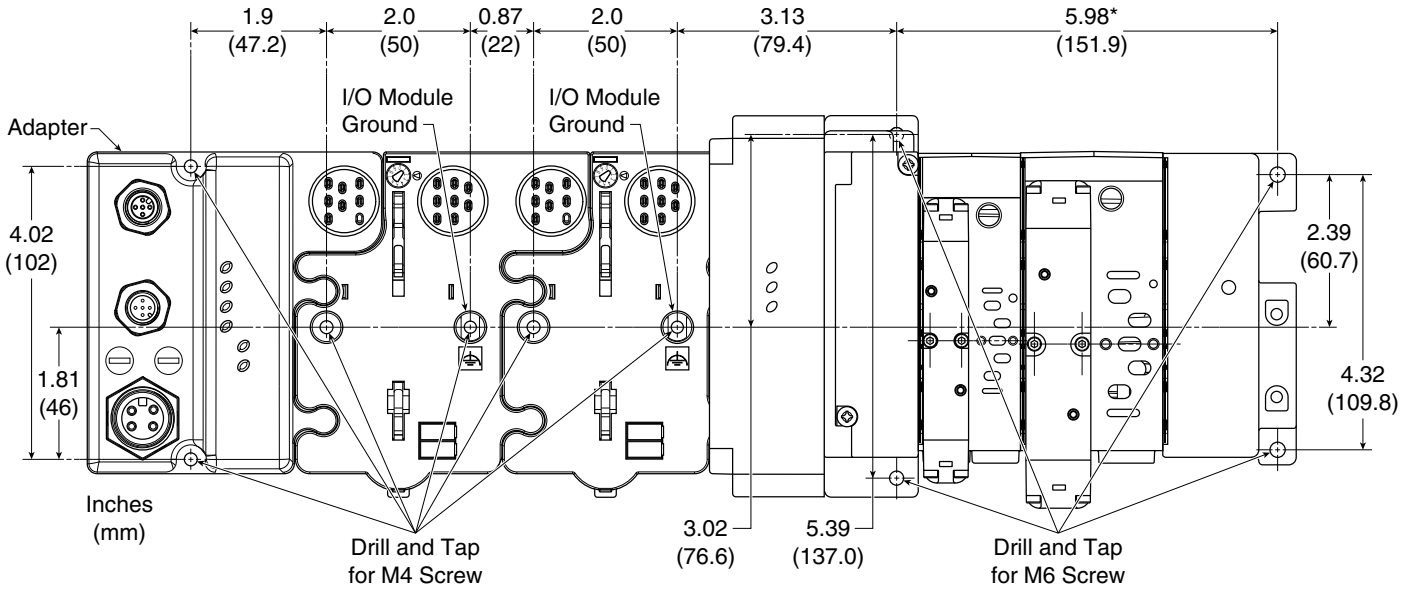
Configure Autobaud

The adapter cannot reconfigure an I/O module that you previously configured to operate at a fixed baud rate. When you reuse a Serial Bus I/O module from another Serial Bus I/O system, configure the module to autobaud before using it with the adapter.

Mount the Adapter and I/O Base

To mount the adapter on a wall or panel, use the screw holes provided in the adapter.

A mounting illustration for the adapter with I/O bases is shown below.



* Depending on the type and number of manifolds, this dimension may vary. Consult Ross for specific information.

Grounding

Each Serial Bus base has two mounting holes, with the one on the right being the means to ground each module. Each module must be grounded.

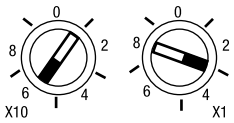
Install the Mounting Base as Follows:

1. Lay out the required points as shown above in the drilling dimension drawing.
2. Drill the necessary holes for #8 (M4) machine or self-tapping screws.
3. Mount the adapter using #8 (M4) screws.
4. Ground the system using the ground lug connection in the I/O base. (The ground lug connection is also a mounting hole.)

Set the Node Address

To set the node address, adjust the switches on the front of the module (refer to the illustration on page 1). Use a small blade screwdriver to rotate the switches. Line up the small notch on the switch with the number setting you wish to use. The two switches are most significant digit (MSD) and least significant digit (LSD). The switches can be set from 01 through 99. The module reads the switches at power-up only.

This example shows the node address set at 63.



The rotary switches are read periodically. If the switches have been changed since the last time they were read and they no longer match the on line address, a minor fault will occur, which is indicated by a flashing red Adapter Status LED.

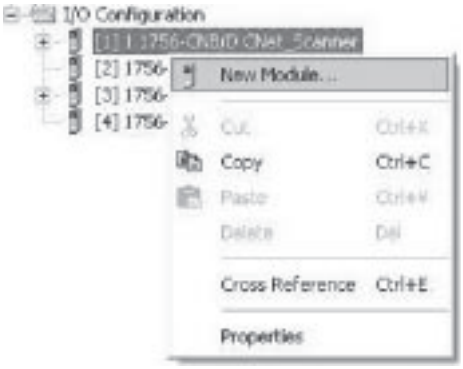
EDS File Requirements

The EDS file is available online at www.rosscontrols.com/rosslit.htm.

Add ControlNet Adapter to RSLogix 5000 I/O Configuration

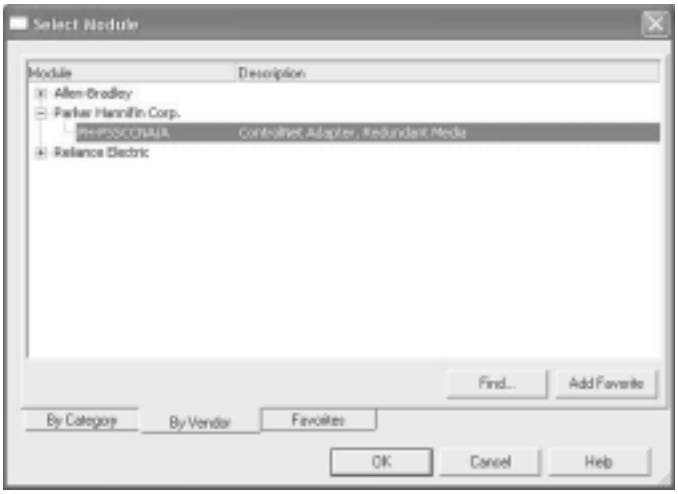
To add your RPSSCCNA to RSLogix 5000 I/O configuration, follow these steps:

- In RSLogix 5000, highlight the ***ControlNet Scanner***, right click and select ***New Module***.

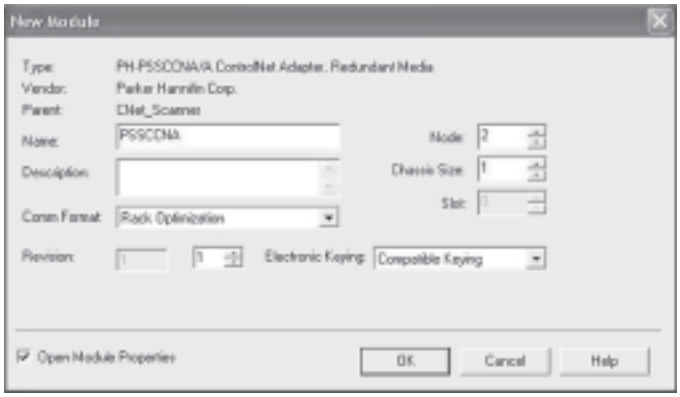


If your RSLogic 5000 is Version 15.X or greater:

- Choose the ***RPSSCCNA*** module from the list of Parker modules.



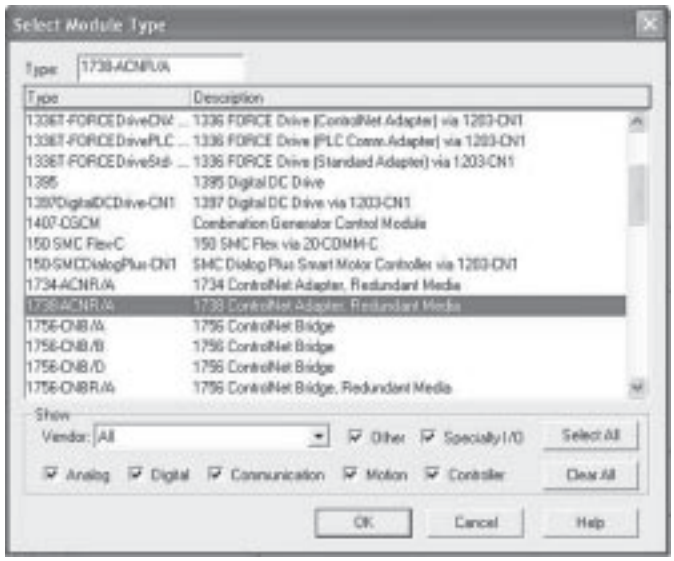
- Enter a name, an appropriate address and chassis size.



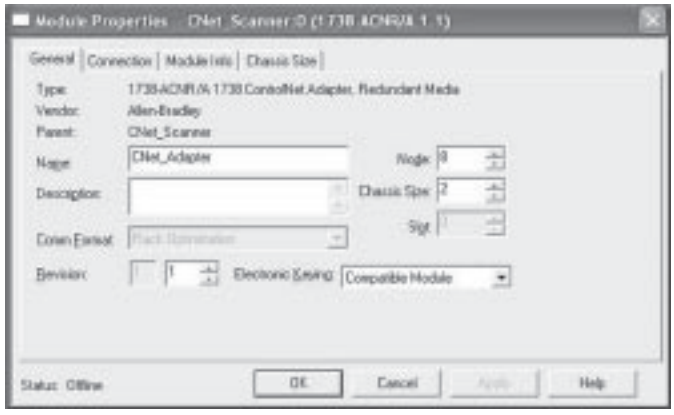
- Choose ***Next*** to set **RPI**.
- Choose ***Finish***. Notice that the RPSSCCNA is now under the I/O configuration.

If your RSLogic 5000 is Version 13.X:

- Choose the ***1738-ACNR/A*** from the list of modules.



- Enter a name, an appropriate node address, and chassis size. Make sure to choose ***Compatible Module for Electronic Keying*** setting.



- Choose ***Next*** to set **RPI.**
- Choose ***Finish***. Notice that the 1738-ACNR is now under the I/O configuration

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Wire the ControlNet Adapter

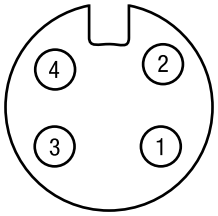
Following are wiring instructions for the ControlNet Adapter.

TNC Cables

- Connect TNC cables to Channel A or B for single media.
- Connect TNC cables to Channel A and B for redundant media.

RPSSCCNA Auxiliary Power (Mini 7/8")

Male In Connector



(view into connector)
Pin 1 - User Power +
Pin 2 - Adapter Power +
Pin 3 - Adapter Power -
Pin 4 - User Power -

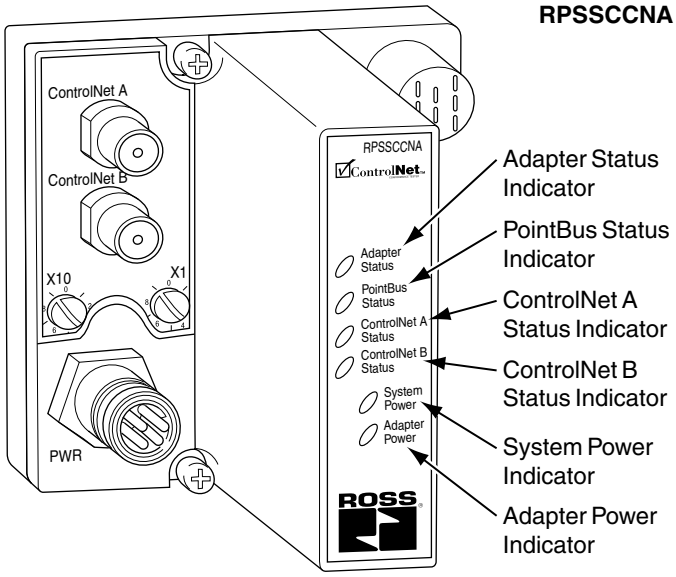
NOTE: User power is the 24VDC power for field devices.

Adapter power is the 24VDC power for adapter. It is converted to 5VDC to power Serial Bus modules.

ATTENTION

Make sure all connectors and caps are securely tightened to properly seal the connections against leaks and maintain IP67 requirements.

Troubleshoot with the Indicators



Indication	Probable Cause
Adapter Status	
Off	No power applied to device
Alternating Red/Green	LED powerup test (module self-test)
Flashing Red	Recoverable fault has occurred: - Firmware (NVS) update - MAC ID changed - CPU load exceeded
Solid Red	Unrecoverable fault has occurred: - Self-test failure (checksum failure at powerup, ramtest failure) at powerup - Firmware fatal error
Flashing Green	Waiting for connection or ControlNet cable break
Solid Green	Module is operating correctly (normal mode)

Indication	Probable Cause
PointBus Status	
Off	Device is not powered - check module status indicator
Alternating Red/Green	LED powerup test
Flashing Red	Recoverable fault has occurred: - At power up the number of expected modules does not equal the number of modules present - A module is missing - Node fault (I/O connection timeout)
Red	Unrecoverable fault has occurred: - The adapter is bus off - The adapter has failed its dup_MAC_ID check
Flashing Green	Adapter is on line with no connections established: - Adapter chassis size has not been configured - Controller in program/idle mode - ControlNet cable break
Green	Adapter is on line with connections established (normal operation, in run mode)

Indication	Probable Cause
ControlNet A/B Status (Viewed Together)	
Both Steady Off	Reset, no power or entire network interface deactivated
Alternating Red/Green	Self-test mode
Alternating Red/Off	Bad/invalid node configuration (such as dup_MAC_ID)
Both Steady Red	Failed link interface

Indication	Probable Cause
ControlNet A/B Status (Viewed Individually)	
Steady Off	Channel disabled or channel not supported
Flashing Red/Green	Invalid link configuration
Flashing Red/Off	Severe link error - link fault or no MAC frames received
Flashing Green/Off	Temporary channel error or listen-only
Steady Green	Normal operation - MAC frames are being received without detected error

Indication	Probable Cause
System Power*	
Off	Not active - Field power is off, overloaded backplane or dc-dc converter problem
Green	Power on - dc-dc converter active (5V)

Indication	Probable Cause
Adapter Power**	
Off	Not active - Field power is off
Green	Power on - 24V present

* System Power Indicator shows the 5V power output from the dc-dc converter.

** Adapter Power Indicator shows the 24V power input to the dc-dc converter.

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Specifications

Following are specifications for the RPSSCCNA ControlNet adapter.

ControlNet Adapter - RPSSCCNA	
Expansion I/O Capacity	• Maximum of 63 modules • Maximum of 5 Rack Optimized connections (for digital modules only) • Maximum of 25 Direct connections • RPSSCCNA backplane current output = 1.0A maximum. See the list below for backplane current consumption for each I/O catalog number and the current consumption for each of the modules connected to the RPSSCCNA. Verify that it is below 1.0A. • Backplane current can be extended beyond 1.0A with a RPSSSE24A Backplane Extension Power Supply. The RPSSSE24A can supply up to an additional 1.3A of backplane current. • Multiple RPSSSE24A modules can be used to reach the maximum of 63 modules. **Cat. No.** — **PointBus Current Requirements** **R**PSSN8xxx — 75 mA RPSSP8xxx — 75 mA RPSST8xxx — 75 mA RPSSTR4M12A — 90 mA RPSSNACM12A — 75 mA RPSSNAVM12A — 75 mA RPSSTACM12A — 75 mA RPSSTAVM12A — 75 mA RPSSS23A — 75 mA RPSSV32A — 75 mA
ControlNet Communication Rate	5Mbits /s (fixed value)
Power Supply Specifications	
Power Supply	**Note:** In order to comply with CE Low Voltage Directives (LVD), you must use either a NEC Class 2, a Safety Extra Low Voltage (SELV) or a Protected Extra Low Voltage (PELV) power supply to power this adapter. A SELV supply cannot exceed 30V rms, 42.4V peak or 60VDC under normal conditions and under single fault conditions. A PELV supply has the same rating and is connected to protected earth.
Input Voltage Rating	24VDC 10-28.8VDC range
Inrush Current	6A maximum for 10ms
Field Side Power Requirements, Maximum	24VDC (+20% = 28.8VDC) @ 425 mA
Interruption	Output voltage will stay within specifications when input drops out for 10ms at 10V with maximum load
General Specifications	
LED Indicators	1 green/red Adapter status 2 green/red ControlNet status 1 green/red PointBus status 1 green System Power (PointBus 5V power) 1 green Adapter Power (24V from field supply)
Power Consumption, Maximum	10.2W @ 28.8VDC
Power Dissipation, Maximum	5.0W @ 28.8VDC
Thermal Dissipation, Maximum	16.9 BTU/hr. @ 28.8VDC
Isolation Voltage (continuous-voltage withstand rating)	50V rms Tested at 1250VAC for 60s
Field Power Bus Nominal Voltage Supply Voltage Supply Current	 24VDC 10-28.8VDC range 10A maximum
Dimensions Inches (Millimeters)	4.41H x 2.83W x 2.56D (112H x 72W x 65D)

General Specifications (continued)	
Operating Temperature	IEC 60068-2-1 (Test Ad, Operating Cold), IEC 60068-2-2 (Test Bd, Operating Dry Heat), IEC 60068-2-14 (Test Nb, Operating Thermal Shock): -20 to 60°C (-4 to 140°F)
Storage Temperature	IEC 60068-2-1 (Test Ab, Un-packaged Non-operating Cold), IEC 60068-2-2 (Test Bb, Un-packaged Non-operating Dry Heat), -40 to 85°C (-40 to 185°F)
Relative Humidity	IEC 60068-2-30 (Test Db, Un-packaged Non-operating Damp Heat): 5-95% non-condensing
Shock	IEC60068-2-27 (Test Ea, Unpackaged Shock): Operating 30g Non-operating 50g
Vibration	IEC60068-2-6 (Test Fc, Operating): 5g @ 10-500Hz
ESD Immunity	IEC 61000-4-2: 6kV contact discharges 8kV air discharges
Radiated RF Immunity	IEC 61000-4-3: 10V/m with 1kHz sine-wave 80%AM from 30MHz to 2000MHz 10V/m with 200Hz 50% Pulse 100%AM at 900Mhz 10V/m with 200Hz 50% Pulse 100%AM at 1890Mhz
EFT/B Immunity	IEC 61000-4-4: ±4kV at 5kHz on power ports ±3kV at 5kHz on signal ports
Surge Transient Immunity	IEC 61000-4-5: ±1kV line-line(DM) and ±2kV line-earth(CM) on power ports ±2kV line-earth(CM) on shielded ports
Conducted RF Immunity	IEC 61000-4-6: 10Vrms with 1kHz sine-wave 80%AM from 150kHz to 80MHz
Emissions	CSPR 11: Group 1, Class A
Enclosure Type Rating	Meets IP65/66/67 (when marked)
Mounting Base Screw Torque	#8 screw, 7.5 in. lbs. in Aluminum, 16 in. lbs. in Steel
Wiring Category[1]	1 - on power ports 1 - on communications ports
Weight Imperial (Metric)	0.80 lb. (0.36 kg)
Certifications: (when product is marked)	c-UL-us UL Listed Industrial Control Equipment, certified for US and Canada CE European Union 89/336/EEC EMC Directive, compliant with: EN 61000-6-4; Industrial Emissions EN 50082-2; Industrial Immunity EN 61326; Meas./Control/Lab., Industrial Requirements EN 61000-6-2; Industrial Immunity C-Tick Australian Radiocommunications Act, compliant with: AS/NZS CISPR 11; Industrial Emissions CI ControlNet Int'l conformance tested to ControlNet specifications

1. Use this Conductor Category information for planning conductor routing. Refer to Publication A10324, “Industrial Automation Wiring and Grounding Guidelines”.

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Installation & Service Instructions
A10313

Serial Bus DeviceNet Adapters, Series A
(RPSSCDM12A, RPSSCDM18PA)

ISSUED: August, 2007
Supersedes: None

⚠WARNING

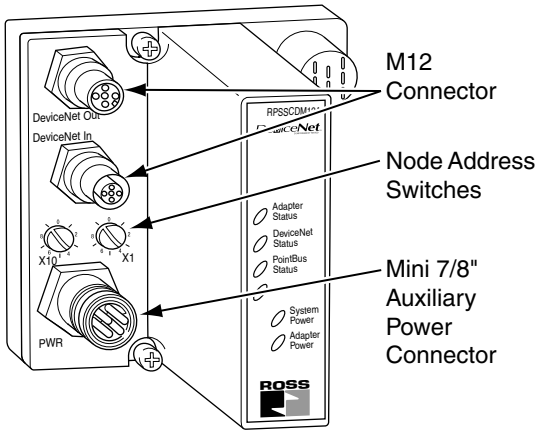
To avoid unpredictable system behavior that can cause personal injury and property damage:

- **Disconnect electrical supply (when necessary) before installation, servicing, or conversion.**
- **Disconnect air supply and depressurize all air lines connected to this product before installation, servicing, or conversion.**
- **Operate within the manufacturer's specified pressure, temperature, and other conditions listed in these instructions.**
- **Medium must be moisture-free if ambient temperature is below freezing.**
- **Service according to procedures listed in these instructions.**
- **Installation, service, and conversion of these products must be performed by knowledgeable personnel who understand how pneumatic products are to be applied.**
- **After installation, servicing, or conversion, air and electrical supplies (when necessary) should be connected and the product tested for proper function and leakage. If audible leakage is present, or the product does not operate properly, do not put into use.**
- **Warnings and specifications on the product should not be covered by paint, etc. If masking is not possible, contact your local representative for replacement labels.**

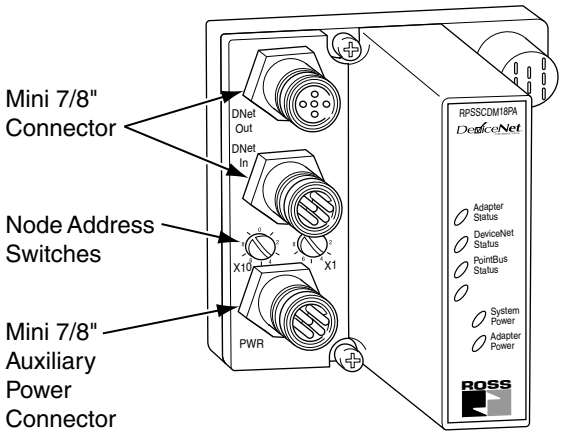
Safety Guide

For more complete information on recommended application guidelines, see the Installation Safety Guidelines section of Bulletin 600 (Form A10309) or you can download the Installation Safety Guidelines at: www.rosscontrols.com/rosslit.htm.

RPSSCDM12A



RPSSCDM18PA



Introduction

Follow these instructions when installing, operating, or servicing the product.

Serial Bus DeviceNet Adapters, Series A

(RPSSCDM12A, RPSSCDM18PA)

The sealed IP67 housing of these adapters requires no enclosure. (Note that environmental requirements other than IP67 may require an additional appropriate housing.) DeviceNet connectors are sealed Micro (M12) or Mini (7/8") styles. The DeviceNet adapters are shown below.

Serial Bus DeviceNet Adapters User Manual

The Serial Bus DeviceNet Adapters A10311 is available online at www.rosscontrols.com/rosslit.htm.

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- Do not touch connectors or pins on component boards.
- Do not touch circuit components inside the equipment.
- If available, use a static-safe workstation.
- When not in use, store the equipment in appropriate static-safe packaging.

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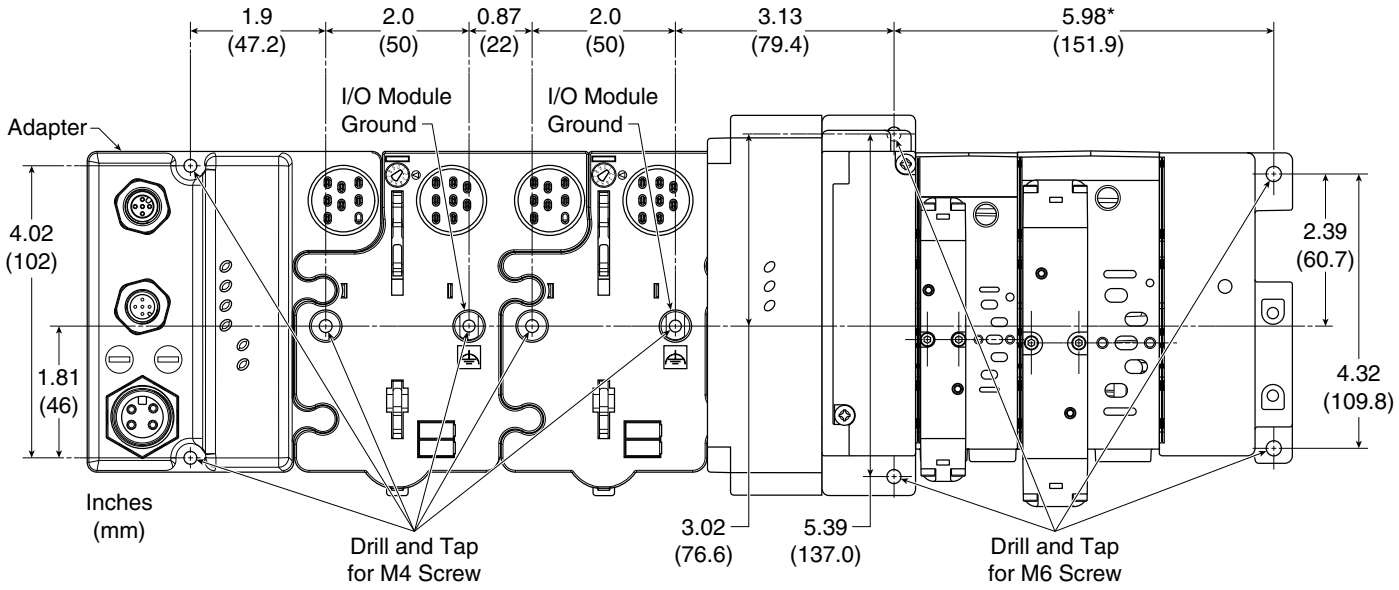
Mount the Adapter and I/O Base

To mount the adapter on a wall or panel, use the screw holes provided in the adapter.

A mounting illustration for the adapter with I/O bases is shown below.



*Depending on the type and number of manifolds, this dimension may vary. Consult Ross for specific information.

Grounding

Each Serial Bus base has two mounting holes, with the one on the right being the means to ground each module. Each module must be grounded.

Install the Mounting Base as Follows:

1. Lay out the required points as shown above in the drilling dimension drawing.
2. Drill the necessary holes for #8 (M4) machine or self-tapping screws.
3. Mount the adapter and I/O bases using #8 (M4) screws.
4. Ground the system using the ground lug connection in the I/O base. (The ground lug connection is also a mounting hole.)

Set the Node Address

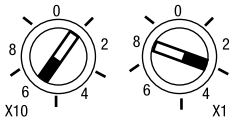
Valid node addresses are **00** through **63**.

Set the node address using either the rotary switches, RSNetWorx for DeviceNet™, DeviceNetManager™, or another software configuration tool. Setting the switches at any number from **64** through **99** lets the software have address control.

Each module is shipped with the switches set for node address **63**. Remove the caps on the front of the module to access the switches (refer to the illustrations on page 1). The two switches are:

- X10 (most significant digit) – left side of module
- X1 (least significant digit) – right side of module

This example shows the node address set at 63.



To reset the node address, use a small blade screwdriver to rotate the switches. Line up the small notch on the switch with the number setting you wish to use and then cycle power.

The rotary switches are read periodically. If the switches have been changed since the last time they were read and they no longer match the on line address, a minor fault will occur, which is indicated by a flashing red Adapter Status LED. Settings of 64 through 99 cause the module to use the **last valid node address stored internally**. Example: The last setting internally was 40. If a change is made to 68, and then you power up, the address will default to 40.

The module is equipped with AutoBaud detect. AutoBaud lets the module read the settings already in use on your DeviceNet network and automatically adjusts to follow those settings.

EDS File Requirements

The EDS files are available online at www.rosscontrols.com/rosslit.htm.

Open Configuration Method

For using DeviceNet Adapters without RSNetWorx™ or RSLogix™ 5000, refer to document “User Guide: Configuration of the Pneumatics Platform using CIP™ Explicit Messaging", which is available online at www.rosscontrols.com/rosslit.htm

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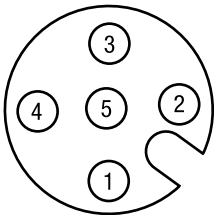
Wire the DeviceNet Adapters

Following are wiring instructions for the DeviceNet Adapters.

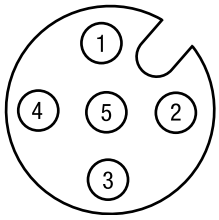
RPSSCDM12A (Micro M12 A - Coding Key)

Male In Connector



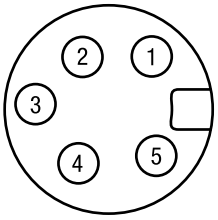
(view into connector)
Pin 1 - Drain
Pin 2 - +V
Pin 3 - -V
Pin 4 - CAN_High
Pin 5 - CAN_Low

Female Out Connector



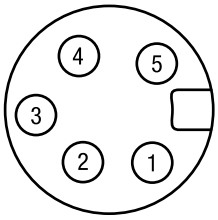
RPSSCDM18PA (Mini 7/8")

Male In Connector



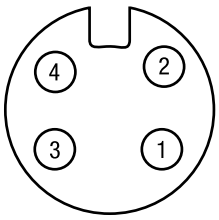
(view into connector)
Pin 1 - Drain
Pin 2 - +V
Pin 3 - -V
Pin 4 - CAN_High
Pin 5 - CAN_Low

Female Out Connector



DeviceNet Auxiliary Power (Mini 7/8")

Male In Connector



(view into connector)
Pin 1 - User Power +
Pin 2 - Adapter Power +
Pin 3 - Adapter Power -
Pin 4 - User Power -

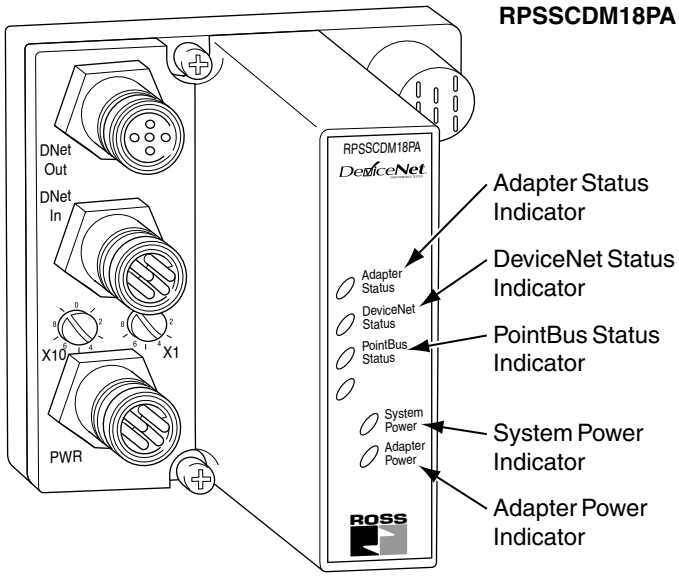
NOTE: User power is the 24VDC power for field devices.

Adapter power is the 24VDC power for adapter. It is converted to 5VDC to power modules.

ATTENTION

Make sure all connectors and caps are securely tightened to properly seal the connections against leaks and maintain IP67 requirements.

Troubleshoot with the Indicators



Indication	Probable Cause
Adapter Status	
Off	No power applied to device
Green	Device operating normally
Flashing Red	Recoverable fault
Red	Unrecoverable fault - may require device replacement
Flashing Red/Green	Device is in self-test

Indication	Probable Cause
DeviceNet Status	
Off	Device is not on line: - Device attempting to Autobaud - Device has not completed dup_MAC-id test - Device not powered - check module status indicator
Flashing Green	Device is on line but has no connections in the established state
Green	Device is on line and has connections in the established state
Flashing Red	One or more I/O connections in timed-out state
Red	Critical link failure - failed communication device. Device detected error that prevents it from communicating on the network. (Possible duplicate MAC ID or baud rate mismatch).

Indication	Probable Cause
PointBus Status	
Off	Device is not on line: - Device has not completed dup_MAC-id test - Device not powered - check module status indicator
Flashing Green	Device is on line but has no connections in the established state
Green	Device is on line and has connections in the established state
Flashing Red	One or more I/O connections in timed-out state
Red	Critical link failure - failed communication device. Device detected error that prevents it from communicating on the network. (Possible duplicate MAC ID or baud rate mismatch).
Flashing Red/Green	Communication faulted device - the device has detected a network access error and is in communication faulted state. Device has received and accepted an Identity Communication Faulted Request - long protocol message.

Indication	Probable Cause
System Power*	
Off	Not active - Field power is off, overloaded backplane or dc-dc converter problem.
Green	System power on - dc-dc converter active (5V).

Indication	Probable Cause
Adapter Power**	
Off	Not active - Field power is off.
Green	System power on, 24V present.

* System Power Indicator shows the 5V power output from the dc-dc converter.

** Adapter Power Indicator shows the 24V power input to the dc-dc converter.

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Specifications

Following are specifications for the DeviceNet adapters.

DeviceNet Adapters - RPSSCDM12A, RPSSCDM18PA	
Expansion I/O Capacity	• DeviceNet adapter backplane current output = 1.0A maximum. See the list below for backplane current consumption for each I/O catalog number and the current consumption for each of the modules connected to the DeviceNet adapter. Verify that it is below 1.0A. • Backplane current can be extended beyond 1.0A with a RPSSSE24A Backplane Extension Power Supply. The RPSSSE24A can supply up to an additional 1.3A of backplane current. • Multiple RPSSSE24A modules can be used to reach the maximum of 63 modules. **Cat. No.** — **PointBus Current Requirements** **R**PSSN8xxx — 75 mA RPSSP8xxx — 75 mA RPSST8xxx — 75 mA RPSSTR4M12A — 90 mA RPSSNACM12A — 75 mA RPSSNAVM12A — 75 mA RPSSTACM12A — 75 mA RPSSTAVM12A — 75 mA RPSSS23A — 75 mA RPSSV32A — 75 mA
DeviceNet Communication Rate	125K bit/s (500m maximum) 250K bit/s (250m maximum) 500K bit/s (100m maximum)
DeviceNet Power Specifications	
Power Supply	**Note:** In order to comply with CE Low Voltage Directives (LVD), you must use either a NEC Class 2, a Safety Extra Low Voltage (SELV) or a Protected Extra Low Voltage (PELV) power supply to power this adapter. A SELV supply cannot exceed 30V rms, 42.4V peak or 60VDC under normal conditions and under single fault conditions. A PELV supply has the same rating and is connected to protected earth.
Input Voltage Rating	24VDC nominal
DeviceNet Input Voltage Range	11-25VDC DeviceNet specification
Input Overvoltage Protection	Reverse polarity protected
DeviceNet Power Requirements	24VDC (+4% = 25VDC) @ 30 mA maximum
Power Supply Specifications	
Power Supply	**Note:** In order to comply with CE Low Voltage Directives (LVD), you must use either a NEC Class 2, a Safety Extra Low Voltage (SELV) or a Protected Extra Low Voltage (PELV) power supply to power this adapter. A SELV supply cannot exceed 30V rms, 42.4V peak or 60VDC under normal conditions and under single fault conditions. A PELV supply has the same rating and is connected to protected earth.
Input Voltage Rating	24VDC 10-28.8VDC range
Input Overvoltage Protection	Reverse polarity protected
Inrush Current	6A maximum for 10ms
PointBus Output Current	1A maximum @ 5VDC ±5% (4.75-5.25)
Field Side Power Requirements, Maximum	24VDC (+20% = 28.8VDC) @ 400 mA
Interruption	Output voltage will stay within specifications when input drops out for 10ms at 10V with maximum load
General Specifications	
LED Indicators	1 green/red Adapter status 1 green/red DeviceNet status 1 green/red PointBus status 1 green System Power (PointBus 5V power) 1 green Adapter Power (24V from field supply)
Power Consumption, Maximum	8.1W @ 28.8VDC

General Specifications (continued)	
Power Dissipation, Maximum	2.8W @ 28.8VDC
Thermal Dissipation, Maximum	9.5 BTU/hr. @ 28.8VDC
Isolation Voltage (continuous-voltage withstand rating)	50V rms Tested at 1250VAC rms for 60s
Serial Power Bus Nominal Voltage Supply Voltage Supply Current	 24VDC 10-28.8VDC range 10A maximum
Dimensions Inches (Millimeters)	4.41H x 2.83W x 2.56D (112H x 72W x 65D)
Operating Temperature	IEC 60068-2-1 (Test Ad, Operating Cold), IEC 60068-2-2 (Test Bd, Operating Dry Heat), IEC 60068-2-14 (Test Nb, Operating Thermal Shock): -20 to 60°C (-4 to 140°F)
Storage Temperature	IEC 60068-2-1 (Test Ab, Un-packaged Non-operating Cold), IEC 60068-2-2 (Test Bb, Un-packaged Non-operating Dry Heat), -40 to 85°C (-40 to 185°F)
Relative Humidity	IEC 60068-2-30 (Test Db, Un-packaged Non-operating Damp Heat): 5-95% non-condensing
Shock	IEC60068-2-27 (Test Ea, Unpackaged Shock): Operating 30g Non-operating 50g
Vibration	IEC60068-2-6 (Test Fc, Operating): 5g @ 10-500Hz
ESD Immunity	IEC 61000-4-2: 6kV contact discharges 8kV air discharges
Radiated RF Immunity	IEC 61000-4-3: 10V/m with 1kHz sine-wave 80%AM from 30MHz to 2000MHz 10V/m with 200Hz 50% Pulse 100%AM at 900Mhz 10V/m with 200Hz 50% Pulse 100%AM at 1890Mhz
EFT/B Immunity	IEC 61000-4-4: ±4kV at 5kHz on power ports ±3kV at 5kHz on signal ports
Surge Transient Immunity	IEC 61000-4-5: ±1kV line-line(DM) and ±2kV line-earth(CM) on power ports ±2kV line-earth(CM) on shielded ports
Conducted RF Immunity	IEC 61000-4-6: 10Vrms with 1kHz sine-wave 80%AM from 150kHz to 80MHz
Emissions	CSPR 11: Group 1, Class A
Enclosure Type Rating	Meets IP65/66/67 (when marked)
Mounting Base Screw Torque	#8 screw, 7.5 in. lbs. in Aluminum, 16 in. lbs. in Steel
Wiring Category[1]	1 - on power ports 1 - on communications ports
Weight Imperial (Metric)	0.80 lb. (0.36 kg)
Certifications: (when product is marked)	c-UL-us UL Listed Industrial Control Equipment, certified for US and Canada CE European Union 89/336/EEC EMC Directive, compliant with: EN 61000-6-4; Industrial Emissions EN 50082-2; Industrial Immunity EN 61326; Meas./Control/Lab., Industrial Requirements EN 61000-6-2; Industrial Immunity C-Tick Australian Radiocommunications Act, compliant with: AS/NZS CISPR 11; Industrial Emissions ODVA ODVA conformance tested to DeviceNet specifications

1. Use this Conductor Category information for planning conductor routing. Refer to Publication A10324, “Industrial Automation Wiring and Grounding Guidelines”.

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Installation & Service Instructions
A10316

Serial Bus EtherNet/IP Adapter, Series A (RPSSCENA)

ISSUED: August , 2007
Supersedes: None

⚠WARNING

To avoid unpredictable system behavior that can cause personal injury and property damage:

- **Disconnect electrical supply (when necessary) before installation, servicing, or conversion.**
- **Disconnect air supply and depressurize all air lines connected to this product before installation, servicing, or conversion.**
- **Operate within the manufacturer's specified pressure, temperature, and other conditions listed in these instructions.**
- **Medium must be moisture-free if ambient temperature is below freezing.**
- **Service according to procedures listed in these instructions.**
- **Installation, service, and conversion of these products must be performed by knowledgeable personnel who understand how pneumatic products are to be applied.**
- **After installation, servicing, or conversion, air and electrical supplies (when necessary) should be connected and the product tested for proper function and leakage. If audible leakage is present, or the product does not operate properly, do not put into use.**
- **Warnings and specifications on the product should not be covered by paint, etc. If masking is not possible, contact your local representative for replacement labels.**

Safety Guide

For more complete information on recommended application guidelines, see the Installation Safety Guidelines section of Bulletin 600 (Form A10309) or you can download the Installation Safety Guidelines at: www.rosscontrols.com/rosslit.htm.

Introduction

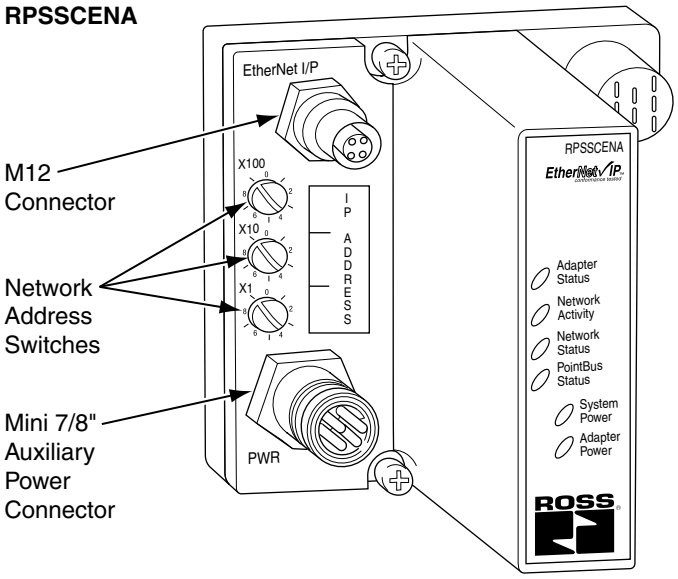
Follow these instructions when installing, operating, or servicing the product.

Serial Bus EtherNet/IP Adapter, Series A

(RPSSCENA)

The sealed IP67 housing of the adapter requires no enclosure. (Note that environmental requirements other than IP67 may require an additional appropriate housing.) The EtherNet/IP connector is a sealed D-coded M12 (micro) style. The EtherNet/IP adapter is shown below.

RPSSCENA



⚠ WARNING

FAILURE OR IMPROPER SELECTION OR IMPROPER USE OF THE PRODUCTS AND/OR SYSTEMS DESCRIBED HEREIN OR RELATED ITEMS CAN CAUSE DEATH, PERSONAL INJURY AND PROPERTY DAMAGE.

This document and other information from ROSS CONTROLS, its subsidiaries and authorized distributors provide product and/or system options for further investigation by users having technical expertise. It is important that you analyze all aspects of your application, including consequences of any failure and review the information concerning the product or systems in the current product catalog. Due to the variety of operating conditions and applications for these products or systems, the user, through its own analysis and testing, is solely responsible for making the final selection of the products and systems and assuring that all performance, safety and warning requirements of the application are met.

The products described herein, including without limitation, product features, specifications, designs, availability and pricing, are subject to change by ROSS CONTROLS and its subsidiaries at any time without notice.

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Serial Bus EtherNet/IP Adapter User Manual

The Serial Bus EtherNet/IP Adapter User Manual PSS-UM004A-EN-P is not available at this time. Please refer to Rockwell Automation 1734 POINT I/O EtherNet/IP Adapter User Manual 1734-UM011A-EN-P for similar setup information, which is available online at http://literature.rockwellautomation.com/.

Important User Information

Solid state equipment has operational characteristics differing from those of electromechanical equipment. *Safety Guidelines for the Application, Installation and Maintenance of Solid State Controls (Form A10325)* (available online at www.rosscontrols.com/rosslit.htm), describes some important differences between solid state equipment and hard-wired electromechanical devices. Because of these differences, and also because of the wide variety of uses for solid state equipment, all persons responsible for applying this equipment must satisfy themselves that each intended application of this equipment is acceptable.

In no event will ROSS CONTROLS® be responsible or liable for indirect or consequential damages to persons or property resulting from the use or application of this equipment.

The examples and diagrams in this manual are included solely for illustrative purposes. Because of the many variables and requirements associated with any particular installation, ROSS CONTROLS cannot assume responsibility or liability for actual use based on the examples and diagrams.

No patent liability is assumed by ROSS CONTROLS with respect to use of information, circuits, equipment, or software described in this manual.

Reproduction of the contents of this manual, in whole or in part, without written permission of ROSS CONTROLS is prohibited.

Throughout this manual we use notes to make you aware of safety considerations.

WARNING	Identifies information about practices or circumstances that can cause an explosion in a hazardous environment, which may lead to personal injury or death, property damage, or economic loss.
IMPORTANT	Identifies information that is critical for successful application and understanding of the product.
ATTENTION	Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss. Attentions help you: • Identify a Hazard • Avoid a Hazard • Recognize the Consequence
SHOCK HAZARD	Labels may be located on or inside the equipment to alert people that dangerous voltage may be present.
BURN HAZARD	Labels may be located on or inside the equipment to alert people that surfaces may be dangerous temperatures.

ATTENTION

Environment and Enclosure

This equipment is intended for use in overvoltage Category II applications (as defined in IEC publication 60664-1), at altitudes up to 2000 meters without derating. This equipment is considered Group 1, Class A industrial equipment according to IEC/CISPR Publication 11. Without appropriate precautions, there may be potential difficulties ensuring electromagnetic compatibility in other environments due to conducted as well as radiated disturbance. This equipment is supplied as “enclosed” equipment. It should not require additional system enclosure when used in locations consistent with the enclosure type ratings stated in the Specifications section of this publication. Subsequent sections of this publication may contain additional information regarding specific enclosure type ratings, beyond what this product provides, that are required to comply with certain product safety certifications.

NOTE: See NEMA Standards publication 250 and IEC publication 60529, as applicable, for explanations of the degrees of protection provided by different types of enclosure. Also, see the appropriate sections in this publication, as well as the publication A10324 (“Industrial Automation Wiring and Grounding Guidelines”), for additional installation requirements pertaining to this equipment.

ATTENTION

Preventing Electrostatic Discharge

This equipment is sensitive to electrostatic discharge, which can cause internal damage and affect normal operation. Follow these guidelines when you handle this equipment:

- Touch a grounded object to discharge potential static.
- Wear an approved grounding wrist strap.
- Do not touch connectors or pins on component boards.
- Do not touch circuit components inside the equipment.
- If available, use a static-safe workstation.
- When not in use, store the equipment in appropriate static-safe packaging.

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Before You Begin

To effectively use your adapter, note the following considerations.

Determine Compatibility

If using the adapter with an Allen-Bradley 1756-ENBT module or 1788-ENBT module, use the following required firmware versions for these bridge modules:

- 1756-ENBT firmware version 2.3 or greater
- 1788-ENBT firmware version 1.33 or greater

If you use the BootP Utility to assign IP addresses to the adapter, use version 2.3.2 or greater.

Understanding Messaging

Class 3 (Explicit Message) requests through the adapter to a specific I/O module may not always receive a response from the I/O module. In the case where the I/O module does not reply to the request, the adapter responds with an error code indicating a time-out.

Establish I/O Connections

When you power up a Serial Bus I/O system and establish I/O connections, the outputs transition to the Idle state, applying Idle state data before going to RUN mode. This occurs even when the controller making the connection is already in RUN mode.

Configure Autobaud

The adapter cannot reconfigure an I/O module that you previously configured to operate at a fixed baud rate. When you reuse a Serial Bus I/O module from another Serial Bus I/O system, configure the module to autobaud before using it with the adapter.

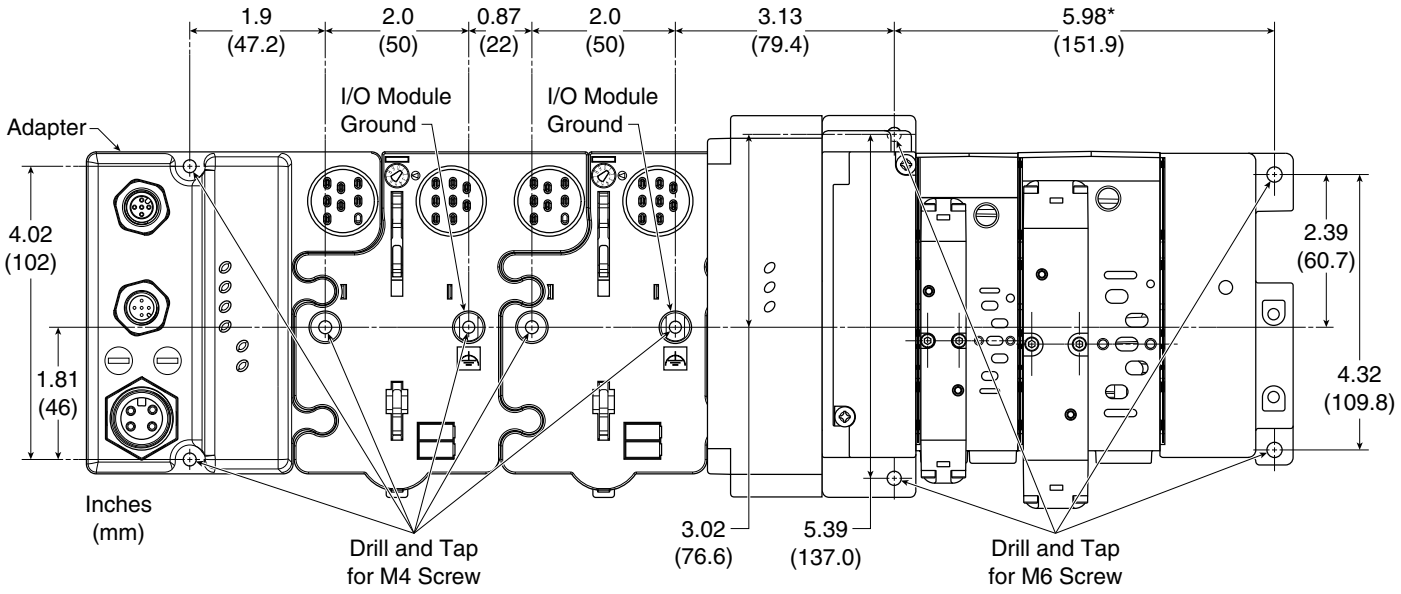
Open Configuration Method

For using Serial Bus EtherNet/IP Adapters without RSNetWorx™ or RSLogix™ 5000, refer to document “User Guide: Configuration of the isysNet™ Pneumatics Platform using Explicit Messaging", which is available at www.rosscontrols.com/rosslit.htm.

Mount the Adapter and I/O Base

To mount the adapter on a wall or panel, use the screw holes provided in the adapter.

A mounting illustration for the adapter with I/O bases is shown below.



* Depending on the type and number of manifolds, this dimension may vary. Consult Ross for specific information.

Grounding

Each Serial Bus base has two mounting holes, with the one on the right being the means to ground each module. Each module must be grounded.

Install the Mounting Base as Follows:

1. Lay out the required points as shown above in the drilling dimension drawing.
2. Drill the necessary holes for #8 (M4) machine or self-tapping screws.
3. Mount the adapter using #8 (M4) screws.
4. Ground the system using the ground lug connection in the I/O base. (The ground lug connection is also a mounting hole.)

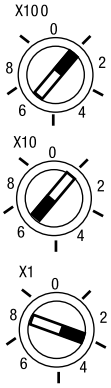
Set the Network Address

To set the network address, you can:

- Adjust the switches on the front of the module
- Use a Dynamic Host Configuration Protocol (DHCP) server
- Retrieve the IP address from nonvolatile memory

The adapter reads the switches first to determine if the switches are set to a valid number. You set the node address by adjusting the 3 switches on the front of the module (refer to the illustration on page 1). Use a small blade screwdriver to rotate the switches. Line up the small notch on the switch with the number setting you wish to use. Valid settings range from 001 through 254.

This example shows the network address set at 163.



When the switches are set to a valid number, the adapter's IP address will be 192.168.1.xxx (where xxx represents the number set on the switches). The adapter's subnet mask will be 255.255.255.0 and the gateway address will be set to 0.0.0.0. When the adapter is reading the network address set on the switches, the adapter will not have a host name assigned to it or use any Domain Name System.

If the switches are set to an invalid number (i.e., 000 or a value greater than 254), the adapter checks to see if DHCP is enabled. If DHCP is enabled, the adapter asks for an address from a DHCP server. The DHCP server will also assign other Transport Control Protocol (TCP) parameters.

If DHCP is not enabled, the adapter will use the IP address (along with other TCP configurable parameters) stored in nonvolatile memory.

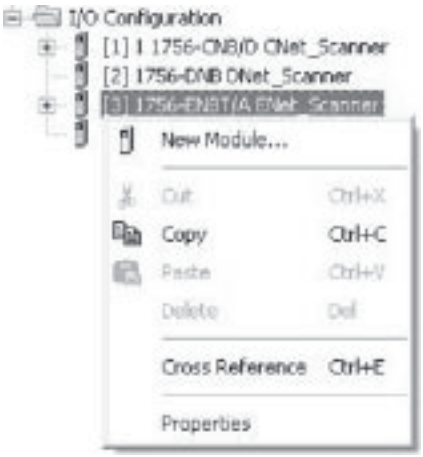
EDS File Requirements

The EDS file is available online at www.rosscontrols.com/rosslit.htm.

Add EtherNet/IP Adapter to RSLogix 5000 I/O Configuration

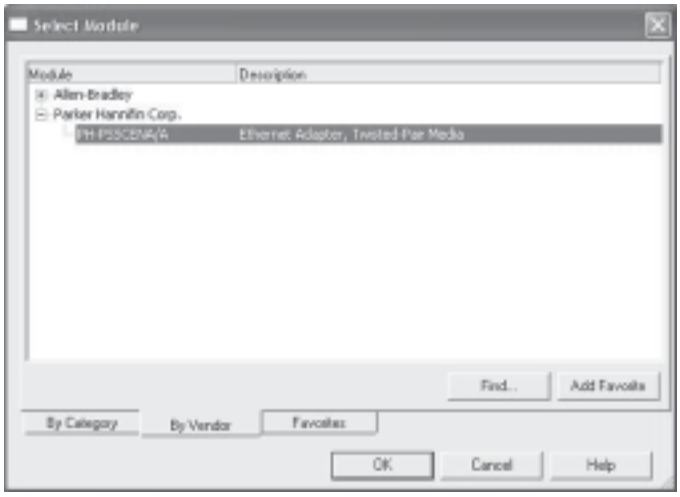
To add your RPSSCENA to RSLogix 5000 I/O configuration, follow these steps:

- In RSLogix 5000, highlight the ***EtherNet/IP Scanner***, right click and select ***New Module***.

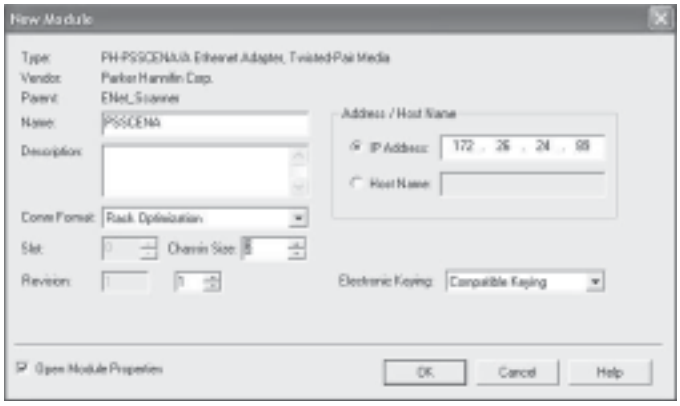


If your RSLogic 5000 is Version 15.X or greater:

- Choose the ***RPSSCENA*** module from the list of Parker modules.



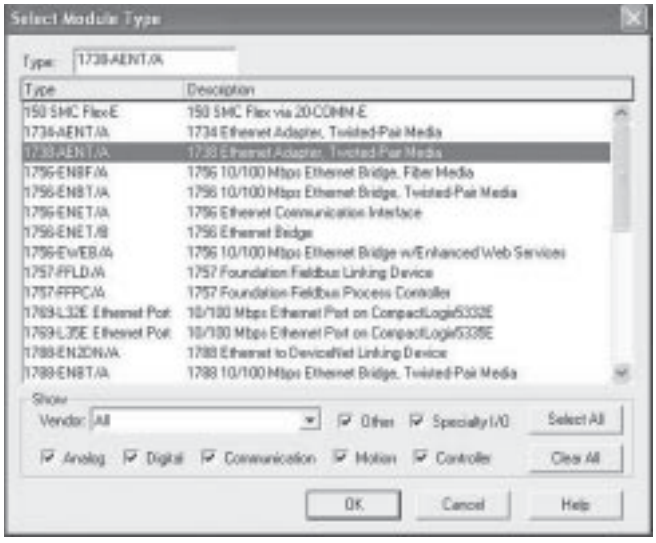
- Enter a name, an appropriate I/P address and chassis size.



- Choose ***Next*** to set **RPI**.
- Choose ***Finish***. Notice that the RPSSCENA is now under the I/O configuration.

If your RSLogic 5000 is Version 13.X:

- Choose the ***1738-AENT/A*** from the list of modules.



- Enter a name, an appropriate IP address, and chassis size. Make sure to choose ***Compatible Module for Electronic Keying*** setting.

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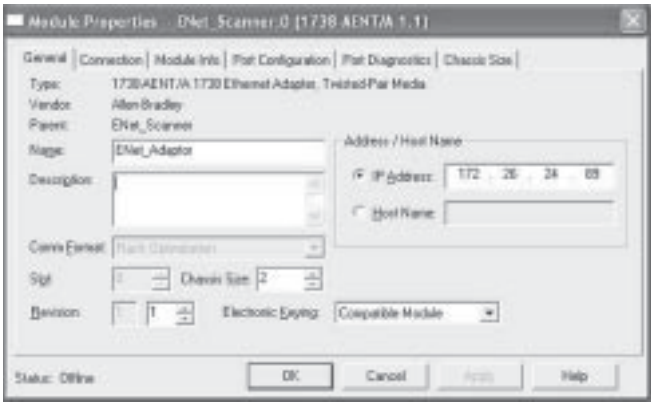


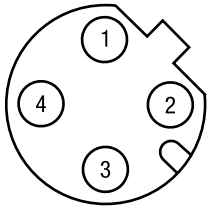
- Choose ***Next*** to set **RPI.**
- Choose ***Finish***. Notice that the 1738-AENT is now under the I/O configuration

Wire the EtherNet/IP Adapter

Following are wiring instructions for the EtherNet/IP Adapter.

RPSSCENA Network Connector (D-Coded M12)

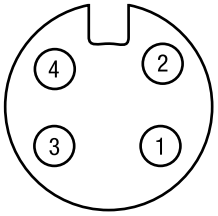
Female In Connector



(view into connector)
Pin 1 - Tx +
Pin 2 - Rx +
Pin 3 - Tx -
Pin 4 - Rx -

RPSSCENA Auxiliary Power (Mini 7/8")

Male In Connector



(view into connector)
Pin 1 - User Power +
Pin 2 - Adapter Power +
Pin 3 - Adapter Power -
Pin 4 - User Power -

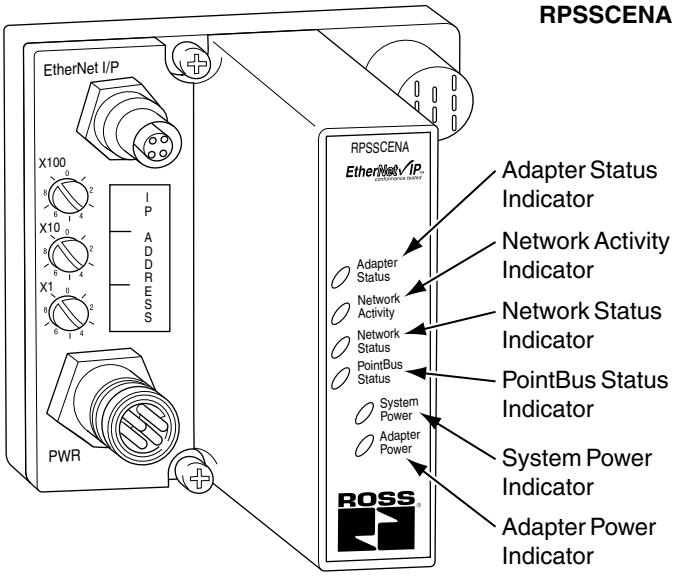
NOTE: User power is the 24VDC power for field devices.

Adapter power is the 24VDC power for adapter. It is converted to 5VDC to power Serial Bus modules.

ATTENTION

Make sure all connectors and caps are securely tightened to properly seal the connections against leaks and maintain IP67 requirements.

Troubleshoot with the Indicators



Indication	Probable Cause
Adapter Status	
Off	No power applied to device
Flashing Red/Green	LED power up test (module self-test)
Green	Device is operating normally
Flashing Red	Recoverable fault has occurred: - Firmware (NVS) update - Network IP address changed - CPU load exceeded
Solid Red	Unrecoverable fault has occurred: - Self-test failure (checksum failure at power up, ramtest) failure at power up - Firmware fatal error

Indication	Probable Cause
Network Activity	
Off	No link established
Flashing Green/Off	Transmit or receive activity
Green	Link established

Indication	Probable Cause
Network Status	
Off	Device is not initialized. The module does not have an IP address.
Flashing Green	No CIP connections. Device has an IP address, but no CIP connections are established.
Green	CIP connections. Device on line, has an IP address, and CIP connections are established.
Flashing Red	One or more Ethernet® connections has timed out.
Red	No link. The module is not physically connected to a powered Ethernet device.
Flashing Red/Green	The module is performing a self test (only occurs during power up test).

Indication	Probable Cause
PointBus Status	
Off	Device not powered - check module status indicator
Flashing Red/Green	Recoverable fault has occurred: - At power up the number of expected modules does not equal the number of modules present - A module is missing - Node fault (I/O connection timeout)
Red	Unrecoverable fault has occurred: - The adapter is bus off - Controller in program/idle mode - Ethernet cable open
Green	Adapter is on line with connections established (normal operation, run mode)

Indication	Probable Cause
System Power*	
Off	Not active - Field power is off, overloaded backplane or dc-dc converter problem
Green	System power on - dc-dc converter active (5V)

Indication	Probable Cause
Adapter Power**	
Off	Not active - Field power is off
Green	Power on - 24V present

* System Power Indicator shows the 5V power output from the dc-dc converter.

** Adapter Power Indicator shows the 24V power input to the dc-dc converter.

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Specifications

Following are specifications for the RPSSCENA EtherNet/IP adapter.

EtherNet/IP Adapter - RPSSCENA	
Expansion I/O Capacity maximum.	• Maximum of 63 modules • Maximum of 5 Rack Optimized connections (for digital modules only) • Maximum of 25 Direct connections • RPSSCENA backplane current output = 1.0A maximum. The actual number of modules can vary. Add up the current requirements of the modules you want to use to make sure they do not exceed the amperage limit of 1.0A for the RPSSCENA. • Backplane current can be extended beyond 1.0A with a RPSSSE24A Backplane Extension Power Supply. Add multiple RPSSSE24A modules to reach the 63 module **Cat. No.** — **PointBus Current Requirements** **R**PSSN8xxx — 75 mA RPSSP8xxx — 75 mA RPSST8xxx — 75 mA RPSSTR4M12A — 90 mA RPSSNACM12A — 75 mA RPSSNAVM12A — 75 mA RPSSTACM12A — 75 mA RPSSTAVM12A — 75 mA RPSSS23A — 75 mA RPSSV32A — 75 mA
EtherNet/IP Communication Rate	10/100Mbits /s, half or full-duplex
Power Supply Specifications	
Power Supply	**Note:** In order to comply with CE Low Voltage Directives (LVD), you must use either a NEC Class 2, a Safety Extra Low Voltage (SELV) or a Protected Extra Low Voltage (PELV) power supply to power this adapter. A SELV supply cannot exceed 30V rms, 42.4V peak or 60VDC under normal conditions and under single fault conditions. A PELV supply has the same rating and is connected to protected earth.
Input Voltage Rating	24VDC nominal 10-28.8VDC range
Inrush Current	6A maximum for 10ms
Field Side Power Requirements, Maximum	24VDC (+20% = 28.8VDC) @ 400 mA
Interruption	Output voltage will stay within specifications when input drops out for 10ms at 10V with maximum load
General Specifications	
LED Indicators	1 green/red Adapter status 1 green Network activity 1 green/red Network status 1 green/red PointBus status 1 green System Power (PoinrBus 5V power) 1 green Adapter Power (24V from field supply)
Power Consumption, Maximum	8.1W @ 28.8VDC
Power Dissipation, Maximum	2.8W @ 28.8VDC
Thermal Dissipation, Maximum	9.5 BTU/hr. @ 28.8VDC
PointBus Output Current, Maximum	1A @ 5VDC ±5% (4.75 - 5.25)
Input Overvoltage Protection	Reverse polarity protected
Isolation Voltage (continuous-voltage withstand rating)	50V rms Tested to withstand 1250VAC rms for 60s
Field Power Bus Nominal Voltage Supply Voltage Supply Current	 24VDC 10-28.8VDC range 10A maximum
Dimensions Inches (Millimeters)	4.41H x 2.83W x 2.56D (112H x 72W x 65D)

General Specifications (continued)		
Operating Temperature	IEC 60068-2-1 (Test Ad, Operating Cold), IEC 60068-2-2 (Test Bd, Operating Dry Heat), IEC 60068-2-14 (Test Nb, Operating Thermal Shock): -20 to 60°C (-4 to 140°F)	
Storage Temperature	IEC 60068-2-1 (Test Ab, Un-packaged Non-operating Cold), IEC 60068-2-2 (Test Bb, Un-packaged Non-operating Dry Heat), -40 to 85°C (-40 to 185°F)	
Relative Humidity	IEC 60068-2-30 (Test Db, Un-packaged Non-operating Damp Heat): 5-95% non-condensing	
Shock	IEC60068-2-27 (Test Ea, Unpackaged Shock): Operating 30g Non-operating 50g	
Vibration	IEC60068-2-6 (Test Fc, Operating): 5g @ 10-500Hz	
ESD Immunity	IEC 61000-4-2: 6kV contact discharges 8kV air discharges	
Radiated RF Immunity	IEC 61000-4-3: 10V/m with 1kHz sine-wave 80%AM from 30MHz to 2000MHz 10V/m with 200Hz 50% Pulse 100%AM at 900Mhz 10V/m with 200Hz 50% Pulse 100%AM at 1890Mhz	
EFT/B Immunity	IEC 61000-4-4: ±4kV at 5kHz on power ports ±2kV at 5kHz on communications ports	
Surge Transient Immunity	IEC 61000-4-5: ±1kV line-line(DM) and ±2kV line-earth(CM) on power ports ±2kV line-earth(CM) on unshielded communications port (tested as balanced circuits)	
Conducted RF Immunity	IEC 61000-4-6: 10Vrms with 1kHz sine-wave 80%AM from 150kHz to 80MHz	
Emissions	CSPR 11: Group 1, Class A	
Enclosure Type Rating	Meets IP65/66/67 (when marked)	
Mounting Base Screw Torque	#8 screw, 7.5 in. lbs. in Aluminum, 16 in. lbs. in Steel	
Wiring Category[1]	1 - on power ports 1 - on communications ports	
Weight Imperial (Metric)	0.80 lb. (0.36 kg)	
Certifications: (when product is marked)	c-UL-us	UL Listed Industrial Control Equipment, certified for US and Canada
	CE	European Union 89/336/EEC EMC Directive, compliant with: EN 61000-6-4; Industrial Emissions EN 50082-2; Industrial Immunity EN 61326; Meas./Control/Lab., Industrial Requirements EN 61000-6-2; Industrial Immunity
	C-Tick	Australian Radiocommunications Act, compliant with: AS/NZS CISPR 11; Industrial Emissions
	EtherNet/IP	ODVA conformance tested to EtherNet/IP specifications

1. Use this Conductor Category information for planning conductor routing. Refer to Publication A10324, “Industrial Automation Wiring and Grounding Guidelines”.

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Installation Safety Guidelines for Selecting and Using ROSS CONTROLS Products and Related Accessories

⚠ WARNING:

FAILURE OR IMPROPER SELECTION OR IMPROPER USE OF ROSS CONTROLS PRODUCTS, ASSEMBLIES OR RELATED ITEMS ("PRODUCTS") CAN CAUSE DEATH, PERSONAL INJURY, PROPERTY DAMAGE. POSSIBLE CONSEQUENCES OF FAILURE OR IMPROPER SELECTION OR IMPROPER USE OF THESE PRODUCTS INCLUDE BUT ARE NOT LIMITED TO:

- Unintended or mistimed cycling or motion of machine members or failure to cycle
- Work pieces or component parts being thrown off at high speeds.
- Failure of a device to function properly for example, failure to clamp or unclamp an associated item or device.
- Explosion
- Suddenly moving or falling objects.
- Release of toxic or otherwise injurious liquids or gasses.

Before selecting or using any of these Products, it is important that you read and follow the instructions below.

1. GENERAL INSTRUCTIONS

1.1. Scope: This safety guide is designed to cover general guidelines on the installation, use, and maintenance of ROSS CONTROLS Valves, FRLs (Filters, Pressure Regulators, and Lubricators), and related accessory components.

1.2. Fail-Safe: Valves, FRLs, and their related components can and do fail without warning for many reasons. Design all systems and equipment in a fail-safe mode, so that failure of associated valves, FRLs or related accessory components will not endanger persons or property.

1.3 Relevant International Standards: For a good guide to the application of a broad spectrum of pneumatic fluid power devices see: ISO 4414:1998, Pneumatic Fluid Power – General Rules Relating to Systems. See www.iso.org for ordering information.

1.4. Distribution: Provide a copy of this safety guide to each person that is responsible for selection, installation, or use of Valves or FRL products. Do not select, or use ROSS CONTROLS valves or FRLs without thoroughly reading and understanding this safety guide as well as the specific ROSS CONTROLS publications for the products considered or selected.

1.5. User Responsibility: Due to the wide variety of operating conditions and applications for valves and FRLs ROSS CONTROLS and its distributors do not represent or warrant that any particular valve or FRL is suitable for any specific end use system. This safety guide does not analyze all technical parameters that must be considered in selecting a product. The user, through its own analysis and testing, is solely responsible for:

- Making the final selection of the appropriate valve, FRL or accessory.
- Assuring that all user's performance, endurance, maintenance, safety, and warning requirements are met and that the application presents no health or safety hazards.
- Complying with all existing warning labels and / or providing all appropriate health and safety warnings on the equipment on which the valves or FRLs are used; and,
- Assuring compliance with all applicable government and industry standards.

1.6. Safety Devices: Safety devices must not be removed, defeated or designed around.

1.7. Warning Labels: Warning labels must not be removed, painted over or otherwise obscured.

1.8. Intake / Exhaust Restriction: Do not restrict the air flow in the supply line. To do so could reduce the pressure of the supply air below the minimum requirements for the valve and thereby cause erratic action. Do not restrict a poppet valve's exhaust port as this can adversely affect its operation. Exhaust silencers must be resistant to clogging and have flow capacities at least as great as the exhaust capacities of the valves. Contamination of the silencer can result in reduced flow and increased back pressure.

1.9. Mechanical power presses and other potentially hazardous machinery using a pneumatically controlled clutch and brake mechanism must use a press control double valve with a monitoring device. A double valve without a self-contained monitoring device should be used only in conjunction with a control system which assures monitoring of the valve. All double valve installations involving hazardous applications should incorporate a monitoring system which inhibits further operation of the valve and machine in the event of a failure within the valve mechanism.

1.10. Additional Questions: Call the appropriate ROSS CONTROLS technical service department if you have any questions or require any additional information. See the ROSS CONTROLS publications for the product being considered or used, or call your local distributor or ROSS CONTROLS' Technical Service department at 1-888-TEK-ROSS in the U.S.A. (1-706-356-3708 outside the U.S.A.). You may find your local ROSS distributor at www.rosscontrols.com.

2. PRODUCT SELECTION INSTRUCTIONS

2.1. Flow Rate: The flow rate requirements of a system are frequently the primary consideration when designing any pneumatic system. System components need to be able to provide adequate flow and pressure for the desired application.

2.2. Pressure Rating: Never exceed the rated pressure of a product. Consult product labeling, ROSS CONTROLS catalogs or the instruction sheets supplied for maximum pressure ratings.

2.3. Temperature Rating: Never exceed the temperature rating of a product. Excessive heat can shorten the life expectancy of a product and result in complete product failure.

2.4. Environment: Many environmental conditions can affect the integrity and suitability of a product for a given application. Ross Controls products are designed for use in general purpose industrial applications. If these products are to be used in unusual circumstances such as direct sunlight and/or corrosive or caustic environments, such use can shorten the useful life and lead to premature failure of a product.

2.5. Lubrication and Compressor Carryover: Some modern synthetic oils can and will attack nitrile seals. If there is any possibility of synthetic oils or greases migrating into the pneumatic components check for compatibility with the seal materials used. Consult the factory or product literature for materials of construction.

2.6. Polycarbonate Bowls and Sight Glasses: All standard ROSS filters and lubricators with polycarbonate plastic bowls are designed for compressed air applications only. Do not fail to use the metal bowl guard, where provided, to minimize danger from high pressure fragmentation in the event of bowl failure. To avoid potential polycarbonate bowl failures:

- Do not locate polycarbonate bowls or sight glasses in areas where they could be subject to direct sunlight, impact blow, or temperatures outside of the rated range.
- Do not expose or clean polycarbonate bowls with detergents, chlorinated hydro-carbons, keytones, esters, liquefied petroleum gas, or certain alcohols.
- Do not use polycarbonate bowls or sight glasses in air systems where compressors are lubricated with fire resistant fluids such as phosphate ester and di-ester lubricants.

2.7. Chemical Compatibility: For more information on plastic component chemical compatibility see ROSS' Catalog 104G (or later version). This can be downloaded at www.rosscontrols.com or can be obtained from your local ROSS distributor.

2.8. Product Rupture: Product rupture can cause death, serious personal injury, and property damage.

- Do not connect pressure regulators or other ROSS CONTROLS products to bottled gas cylinders.
- Do not exceed the maximum primary pressure rating of any pressure regulator or any system component.
- Consult product labeling or product literature for pressure rating limitations.

2.9 ROSS expressly disclaims all warranties and responsibility for any unsatisfactory performance or injuries caused by the use of the wrong type, wrong size, or inadequately maintained silencer installed with a ROSS product.

3. PRODUCT ASSEMBLY AND INSTALLATION INSTRUCTIONS

3.1. Component Inspection: Prior to assembly or installation a careful examination of the valves and FRLs must be performed. All components must be checked for correct style, size, and catalog number. DO NOT use any component that displays any signs of nonconformance.

3.2. Installation Instructions: ROSS CONTROLS published installation instructions must be followed for installation of ROSS CONTROLS valves and FRLs. These instructions are provided with every ROSS CONTROLS valve and FRL sold, or by going to www.rosscontrols.com/rosslit.htm. All applicable instructions should be read and complied with before using any fluid power system in order to prevent harm to persons or equipment. In addition, overhauled or serviced valves must be functionally tested prior to installation or use.

3.3. Air Supply: The air supply or control medium supplied to valves and FRLs must be moisture-free if ambient temperature can drop below freezing

4. VALVE AND FRL MAINTENANCE AND REPLACEMENT INSTRUCTIONS

4.1. Maintenance: Even with proper selection and installation, valve and FRL service life may be significantly reduced without a continuing maintenance program. The severity of the application, risk potential from a component failure, and experience with any known failures in the application or in similar applications should determine the frequency of inspections and the servicing or replacement of ROSS CONTROLS products so that products are replaced before any failure occurs. A maintenance program must be established and followed by the user and, at minimum, must include instructions 4.2 through 4.9.

4.2. Installation and Service Instructions: Before attempting to service or replace any worn or damaged parts consult the appropriate service bulletin or installation / instruction sheet for the for the valve or FRL in question for the appropriate practices to service the unit in question. These Service and Installation Instructions are provided with every ROSS CONTROLS valve and FRL sold, or are available by calling 1-800-GET-ROSS, or by accessing the ROSS CONTROLS web site at www.rosscontrols.com.

4.3. Lockout / Tagout Procedures: Be sure to follow all required lockout and tagout procedures when servicing equipment. For more information see: ANSI/ASSE Z244.1-2003 and OSHA Standard – 29 CFR, Part 1910.147, Appendix A, The Control of Hazardous Energy – (Lockout / Tagout)

4.4. Visual Inspection: Any of the following conditions requires immediate system shut down and replacement of worn or damaged components:

- Air leakage: Look and listen to see if there are any signs of visual damage to any of the components in the system. Leakage is an indication of worn or damaged components.
- Damaged or degraded components: Look to see if there are any visible signs of wear or component degradation.
- Kinked, crushed, or damaged hoses. Kinked hoses can result in restricted air flow and lead to unpredictable system behavior.
- Any observed improper system or component function: Immediately shut down the system and correct malfunction.
- Excessive dirt build-up: Dirt and clutter can mask potentially hazardous situations.

Caution: Leak detection solutions should be rinsed off after use.

4.5. Routine Maintenance Issues:

- Remove excessive dirt, grime and clutter from work areas.
- Make sure all required guards and shields are in place.

4.6. Functional Test: Before initiating automatic operation, operate the system manually to make sure all required functions operate properly and safely.

4.7. Service or Replacement Intervals: It is the user's responsibility to establish appropriate service intervals. Valves and FRLs contain components that age, harden, wear, and otherwise deteriorate over time. Environmental conditions can significantly accelerate this process. Valves and FRLs need to be serviced or replaced on routine intervals. Service intervals need to be established based on:

- Previous performance experiences.
- Government and / or industrial standards.
- When failures could result in unacceptable down time, equipment damage or personal injury risk.

4.8. Servicing or Replacing of any Worn or Damaged Parts: To avoid unpredictable system behavior that can cause death, personal injury and property damage:

- Follow all government, state and local safety and servicing practices prior to service including but not limited to all OSHA Lockout Tagout procedures (ANSI/ASSE Z244.1-2003 and OSHA Standard – 29 CFR, Part 1910.147, Appendix A, The Control of Hazardous Energy – Lockout / Tagout).
- Disconnect electrical supply (when necessary) before installation, servicing, or conversion.
- Disconnect air supply and depressurize all air lines connected to system and ROSS CONTROLS products before installation, service, or conversion.
- Installation, servicing, and / or conversion of these products must be performed by knowledgeable personnel who understand how pneumatic products are to be applied.
- After installation, servicing, or conversions air and electrical supplies (when necessary) should be connected and the product tested for proper function and leakage. If audible leakage is present, or if the product does not operate properly, do not put product or system into use.
- Warnings and specifications on the product should not be covered or painted over. If masking is not possible, contact your local representative for replacement labels.

4.9. Putting Serviced System Back into Operation: Follow the guidelines above and all relevant Installation and Maintenance Instructions supplied with the valve or FRL to insure proper function of the system.

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Installation & Service Instructions A10323

Serial Bus I/O RS-232 ASCII Module, Series A (RPSSS23A)

ISSUED: August, 2007
Supersedes: None

⚠ WARNING

To avoid unpredictable system behavior that can cause personal injury and property damage:

- **Disconnect electrical supply (when necessary) before installation, servicing, or conversion.**
- **Disconnect air supply and depressurize all air lines connected to this product before installation, servicing, or conversion.**
- **Operate within the manufacturer's specified pressure, temperature, and other conditions listed in these instructions.**
- **Medium must be moisture-free if ambient temperature is below freezing.**
- **Service according to procedures listed in these instructions.**
- **Installation, service, and conversion of these products must be performed by knowledgeable personnel who understand how pneumatic products are to be applied.**
- **After installation, servicing, or conversion, air and electrical supplies (when necessary) should be connected and the product tested for proper function and leakage. If audible leakage is present, or the product does not operate properly, do not put into use.**
- **Warnings and specifications on the product should not be covered by paint, etc. If masking is not possible, contact your local representative for replacement labels.**

Safety Guide

For more complete information on recommended application guidelines, see the Installation Safety Guidelines section of Bulletin 600 (Form A10309) or you can download the Installation Safety Guidelines at: www.rosscontrols.com/rosslit.htm.

Introduction

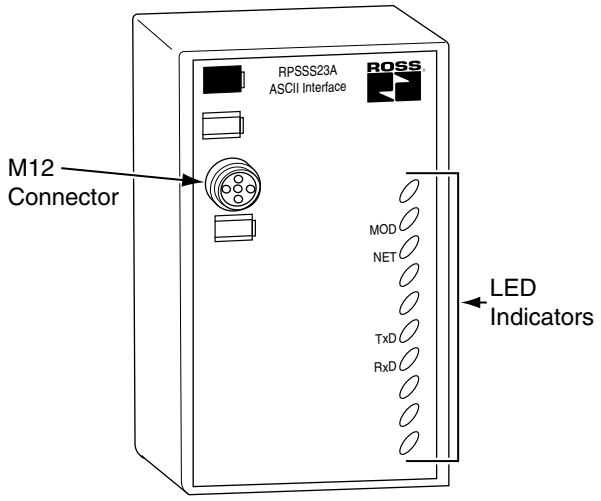
Follow these instructions when installing, operating, or servicing the product.

Serial Bus I/O RS-232 ASCII Module, Series A

(RPSSS23A)

The sealed IP67 housing of the module requires no enclosure. (Note that environmental requirements other than IP67 may require an additional appropriate housing.) The I/O connector is a sealed M12 (micro) style. The mounting base ships with the module. The RPSSS23A module is shown below.

RPSSS23A



⚠ WARNING

FAILURE OR IMPROPER SELECTION OR IMPROPER USE OF THE PRODUCTS AND/OR SYSTEMS DESCRIBED HEREIN OR RELATED ITEMS CAN CAUSE DEATH, PERSONAL INJURY AND PROPERTY DAMAGE.

This document and other information from ROSS CONTROLS, its subsidiaries and authorized distributors provide product and/or system options for further investigation by users having technical expertise. It is important that you analyze all aspects of your application, including consequences of any failure and review the information concerning the product or systems in the current product catalog. Due to the variety of operating conditions and applications for these products or systems, the user, through its own analysis and testing, is solely responsible for making the final selection of the products and systems and assuring that all performance, safety and warning requirements of the application are met.

The products described herein, including without limitation, product features, specifications, designs, availability and pricing, are subject to change by ROSS CONTROLS and its subsidiaries at any time without notice.

EXTRA COPIES OF THESE INSTRUCTIONS ARE AVAILABLE FOR INCLUSION IN EQUIPMENT / MAINTENANCE MANUALS THAT UTILIZE THESE PRODUCTS. CONTACT YOUR LOCAL REPRESENTATIVE.

Important User Information

Solid state equipment has operational characteristics differing from those of electromechanical equipment. *Safety Guidelines for the Application, Installation and Maintenance of Solid State Controls (Form #A10325)* (available online at www.rosscontrols.com/rosslit.htm), describes some important differences between solid state equipment and hard-wired electromechanical devices. Because of these differences, and also because of the wide variety of uses for solid state equipment, all persons responsible for applying this equipment must satisfy themselves that each intended application of this equipment is acceptable.

In no event will ROSS CONTROLS® be responsible or liable for indirect or consequential damages to persons or property resulting from the use or application of this equipment.

The examples and diagrams in this manual are included solely for illustrative purposes. Because of the many variables and requirements associated with any particular installation, ROSS CONTROLS cannot assume responsibility or liability for actual use based on the examples and diagrams.

No patent liability is assumed by ROSS CONTROLS with respect to use of information, circuits, equipment, or software described in this manual.

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Throughout this manual we use notes to make you aware of safety considerations.

WARNING	Identifies information about practices or circumstances that can cause an explosion in a hazardous environment, which may lead to personal injury or death, property damage, or economic loss.
IMPORTANT	Identifies information that is critical for successful application and understanding of the product.
ATTENTION	Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss. Attentions help you: • Identify a Hazard • Avoid a Hazard • Recognize the Consequence
SHOCK HAZARD	Labels may be located on or inside the equipment to alert people that dangerous voltage may be present.
BURN HAZARD	Labels may be located on or inside the equipment to alert people that surfaces may be dangerous temperatures.

ATTENTION

Environment and Enclosure

This equipment is intended for use in overvoltage Category II applications (as defined in IEC publication 60664-1), at altitudes up to 2000 meters without derating. This equipment is considered Group 1, Class A industrial equipment according to IEC/CISPR Publication 11. Without appropriate precautions, there may be potential difficulties ensuring electromagnetic compatibility in other environments due to conducted as well as radiated disturbance. This equipment is supplied as "enclosed" equipment. It should not require additional system enclosure when used in locations consistent with the enclosure type ratings stated in the Specifications section of this publication. Subsequent sections of this publication may contain additional information regarding specific enclosure type ratings, beyond what this product provides, that are required to comply with certain product safety certifications.

NOTE: See NEMA Standards publication 250 and IEC publication 60529, as applicable, for explanations of the degrees of protection provided by different types of enclosure. Also, see the appropriate sections in this publication, as well as the publication A10324 ("Industrial Automation Wiring and Grounding Guidelines"), for additional installation requirements pertaining to this equipment.

ATTENTION

Preventing Electrostatic Discharge

This equipment is sensitive to electrostatic discharge, which can cause internal damage and affect normal operation. Follow these guidelines when you handle this equipment:

- Touch a grounded object to discharge potential static.
- Wear an approved grounding wrist strap.
- Do not touch connectors or pins on component boards.
- Do not touch circuit components inside the equipment.
- If available, use a static-safe workstation.
- When not in use, store the equipment in appropriate static-safe packaging.

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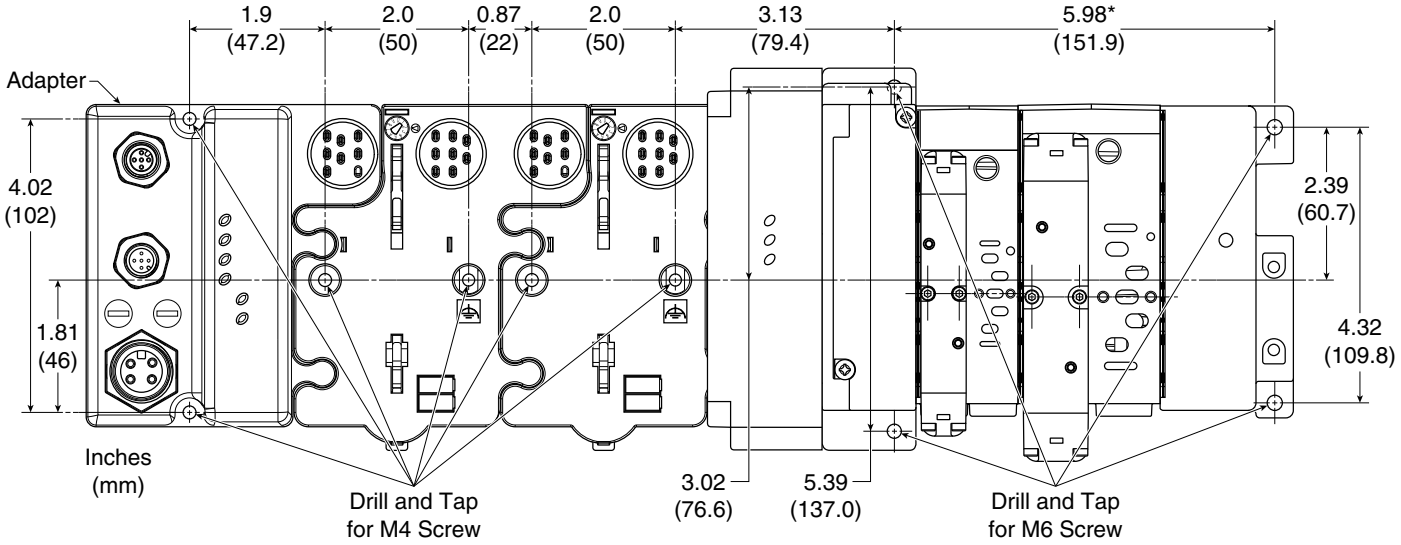
Mount the I/O Base

To mount the I/O base on a wall or panel, use the screw holes provided in the base.

IMPORTANT

The I/O module must be mounted on a grounded metal mounting plate or other conductive surface.

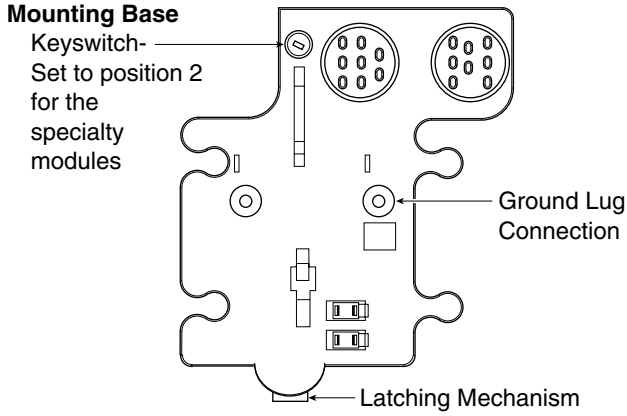
A mounting illustration for the base with an adapter is shown below.



*Depending on the type and number of manifolds, this dimension may vary. Consult Ross for specific information.

Install the Mounting Base as Follows:

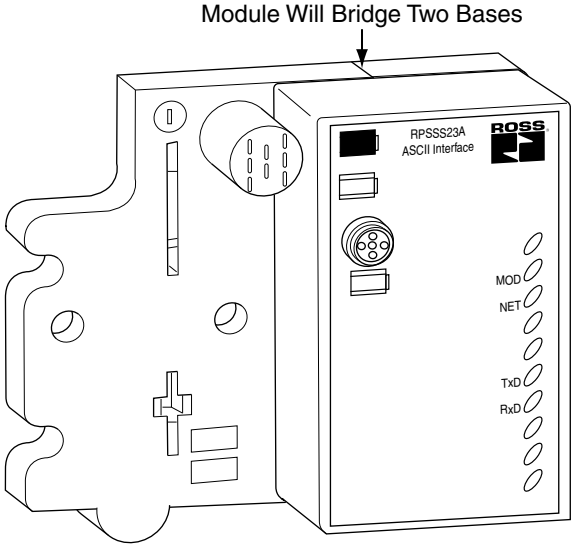
1. Lay out the required points as shown above in the drilling dimension drawing.
2. Drill the necessary holes for #8 (M4) machine or self-tapping screws.
3. Mount the base using #8 (M4) screws.
4. Ground the system using the ground lug connection. (The ground lug connection is also a mounting hole.)



Install the RS-232 ASCII Module

To Install the RS-232 ASCII Module, Proceed as Follows:

1. Using a bladed screwdriver, rotate the keyswitch on the mounting base clockwise until the number 2 aligns with the notch in the base.
2. Position the module vertically above the mounting base. The module will bridge two bases.



3. Push the module down until it engages the latching mechanism. You will hear a clicking sound when the module is properly engaged.

The locking mechanism will lock the module to the base.

Remove the RS-232 ASCII Module From the Mounting Base

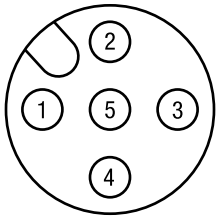
To Remove the Module from the Mounting Base:

1. Put a flat blade screwdriver into the slot of the orange latching mechanism.
2. Push the screwdriver toward the I/O module to disengage the latch. The module will lift up off the base.
3. Pull the module off of the base.

Wire the RS-232 ASCII Module

Following are wiring instructions for the RS-232 ASCII module.

RPSSS23A



(view into connector)

Pin 1 - No Connect

Pin 2 - Tx +

Pin 3 - Rx +

Pin 4 - Common

Pin 5 - No Connect

IMPORTANT

The RPSSS23A module has earth grounded metal rings. This should be considered when choosing shielded cables and grounding techniques.

ATTENTION

Make sure all connectors and caps are securely tightened to properly seal the connections against leaks and maintain IP67 requirements.

Communicate With Your Module

The RS-232 ASCII module operates as the PointBus front-end to your serial device. Data can be exchanged with the master through a polled, cyclic, or change of state connection. The module produces and consumes 4 to 132 bytes of data.

EDS File Requirements

The EDS file is available online at www.rosscontrols.com/rosslit.htm

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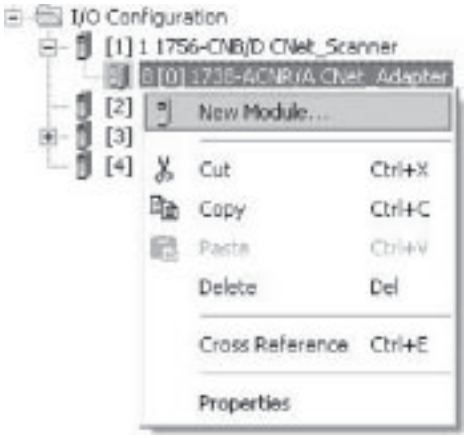
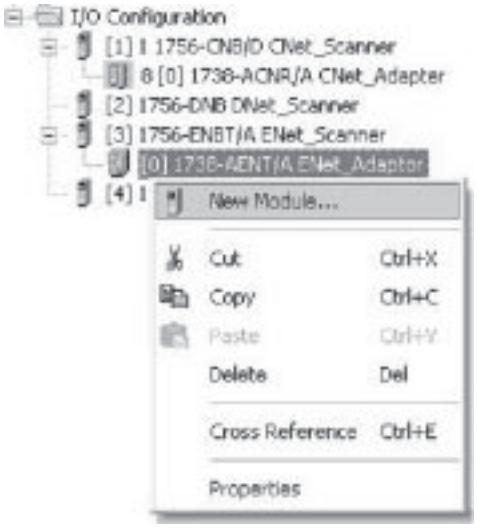
Add RS-232 ASCII Module to RSLogix 5000 I/O Configuration

To add your RS-232 ASCII module to RSLogix 5000 I/O configuration, follow these steps:

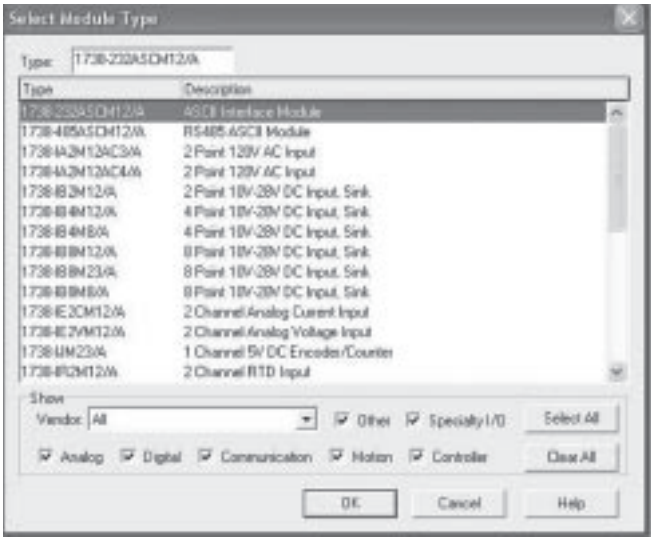
- In RSLogix 5000:
  - For ControlNet, highlight the ***1738-ACNR***, right click and select ***New Module***.



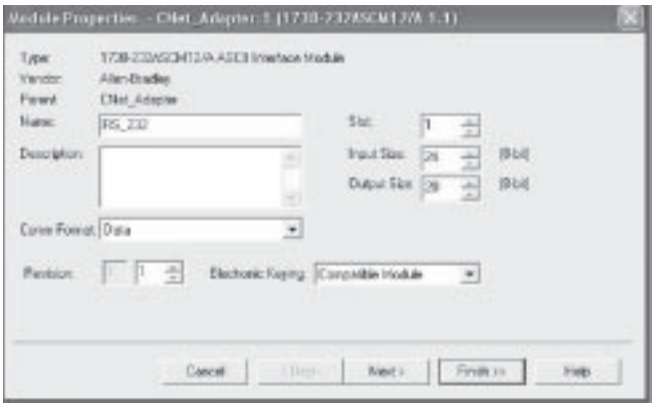
  - For EtherNet/IP, highlight the ***1738-AENT***, right click and select ***New Module***.



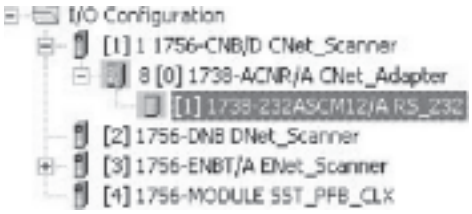
- Choose the equivalent Rockwell Automation module 1738-232ASCM12 from the list of modules.



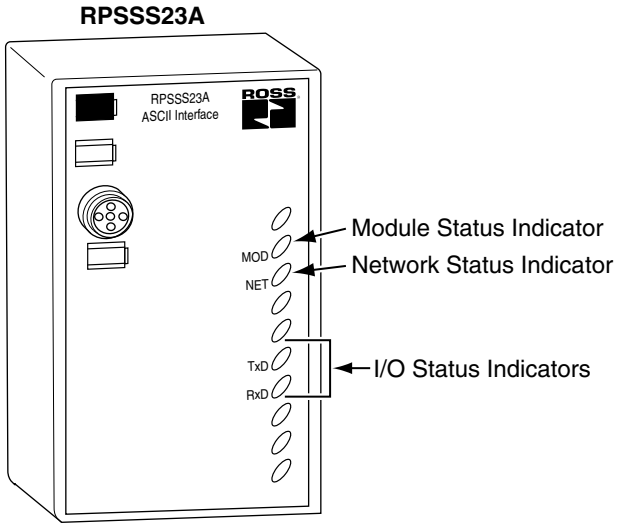
- Enter a name (optional), slot number, and comm. format. Make sure to choose **Compatible Module** for **Electronic Keying** setting.



- Choose **Next** to set **RPI.**
- Choose **Finish**. Notice that the RS-232 ASCII module is now under the I/O configuration



Troubleshoot With the Indicators



Indication	Probable Cause
Module Status	
Off	No power applied to device
Green	Device operating normally
Flashing Green	Device needs commissioning due to missing, incomplete, or incorrect configuration
Flashing Red	Recoverable fault
Red	Unrecoverable fault - may require device replacement
Flashing Red/Green	Device is in self-test

Indication	Probable Cause
Network Status	
Off	Device is not on line: - Device has not completed dup_MAC-id test. - Device not powered - check module status indicator.
Flashing Green	Device is on line but has no connections in the established state.
Green	Device is on line and has connections in the established state.
Flashing Red	One or more I/O connections in timed-out state.
Red	Critical link failure - failed communication device. Device detected error that prevents it from communicating on the network.
Flashing Red/Green	Communication faulted device - the device has detected a network access error and is in communication faulted state. Device has received and accepted an Identity Communication Faulted Request - long protocol message.

Indication	Probable Cause
Transmit/Receive Status	
Flashing Transmit/Receive	Check wiring, ground, and Rx connection. User parameter object to view record numbers.
Flashing Receive/ Off Transmit	Check wiring. Watch the Tx light. If it does not flash, check to ensure that you are properly initiating transmission. Use the EDS parameter object to try transmitting and watch the light. If it flashes, you are not properly initiating transmission via I/O messaging. If it does flash, check the remote device.
Off Transmit/ Green Receive	Check connections as you may have wired the device backwards.

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Specifications

Following are specifications for the RPSSS23A RS-232 ASCII module.

RS-232 ASCII Module - RPSSS23A	
Inputs per Module	1 full duplex
Input Voltage “0”, Asserted, ON, Space, Active “1”, Disasserted, OFF, Mark, Inactive	Signal with respect to Signal Ground (SG) +3 to +25VDC -3 to -25VDC
Indicators	1 green/red module status indicator, logic side 1 green/red network status indicator, logic side 2 green TXD, RXD status indicators, logic side
Keyswitch Position	2 (specialty)
Current, Maximum	75 mA @ 5VDC
Power Dissipation, Maximum	0.75W @ 28.8VDC
Thermal Dissipation, Maximum	2.5 BTU/hr. @ 28.8VDC
Isolation Voltage (continuous voltage withstand rating)	50V rms Tested at 1250VAC rms for 60s
External DC Power Supply Voltage Voltage Range Supply Current	 24VDC nominal 10-28.8VDC 15 mA @ 24VDC Fault protected to 28.8VDC
Serial Port Parameters	
Serial Character Framing	7N2, 7E1, 7O1, 8N1, 8N2, 8E1, 8O1, 7E2, 7O2
Serial Port Comm Speed	9600, 1200, 2400, 4800, 19.2k, 38.4k
Serial Port Receive from ASCII Device	
Maximum Number of Receive Characters	1-128
Receive Record Start Mode	No, exclude, include start delimiter
Receive Start Delimiter	ASCII character
Receive Record End Mode	No, exclude, include start delimiter
Receive End Delimiter	ASCII character
Send (Produce) on DeviceNet to Master	
Receive String Data Type	Array, short_string, string
Pad Mode	Pad mode disabled, enabled
Pad Character	ASCII character
Receive Swap Mode	Disabled, 16-bit, 24-bit, 32-bit swap
DeviceNet Handshake Mode	Master/slave handshake, produce immediate
Produce Assembly Size	4-132
Serial Data	0-128 bytes
Receive Transaction ID	0-255
Serial Port Transmit to ASCII Device	
Maximum Number of Transmit Characters	1-128
Transmit End Delimiter Mode	No, exclude, include end delimiter
Transmit End Delimiter Character	ASCII
Consume on DeviceNet from Master	
Consume String Data Type	Array, short_string, string
Transmit Swap Mode	Disabled, 16-bit, 24-bit, 32-bit swap
DeviceNet Record Header Mode	Transmit handshake/immediate
Consume Assembly Size	4-132

Serial Port Transmit/Explicit Messages	
Transmit Serial Data String	0-128 bytes
Transmitted Serial Data Length	0-128 bytes
Transmit Transaction ID	0-255
Status	TX FIFO overflow, RX FIFO overflow, RX parity error, handshake error, new data flag
General Specifications	
Dimensions Inches (Metric)	1.25H x 2.63W x 4.25D (31.75H x 66.80W x 107.95D)
Operating Temperature	IEC 60068-2-1 (Test Ad, Operating Cold), IEC 60068-2-2 (Test Bd, Operating Dry Heat), IEC 60068-2-14 (Test Nb, Operating Thermal Shock): -20 to 60°C (-4 to 140°F)
Storage Temperature	IEC 60068-2-1 (Test Ab, Un-packaged Non-operating Cold), IEC 60068-2-2 (Test Bb, Un-packaged Non-operating Dry Heat), -40 to 85°C (-40 to 185°F)
Relative Humidity	IEC 60068-2-30 (Test Db, Un-packaged Non-operating Damp Heat): 5 to 95% non-condensing
Shock	IEC60068-2-27 (Test Ea, Unpackaged Shock): Operating 30g Non-operating 50g
Vibration	IEC60068-2-6 (Test Fc, Operating): 5g @ 10 to 500Hz
ESD Immunity	IEC 61000-4-2: 6kV contact discharges 8kV air discharges
Radiated RF Immunity	IEC 61000-4-3: 10V/m with 1kHz sine-wave 80%AM from 30MHz to 2000MHz 10V/m with 200Hz 50% Pulse 100%AM at 900Mhz 10V/m with 200Hz 50% Pulse 100%AM at 1890Mhz
EFT/B Immunity	IEC 61000-4-4: ±2kV at 5kHz on communications ports
Surge Transient Immunity	IEC 61000-4-5: ±2kV line-earth(CM) on shielded ports
Conducted RF Immunity	IEC 61000-4-6: 10Vrms with 1kHz sine-wave 80%AM from 150kHz to 80MHz
Emissions	CSPR 11: Group 1, Class A
Enclosure Type Rating	Meets IP65/66/67 (when marked)
Mounting Base Screw Torque	#8 screw, 7.5 in. lbs. in Aluminum, 16 in. lbs. in Steel
Wiring Category[1]	2 - on communications ports
Weight Imperial (Metric)	0.637 lb. (0.289 kg)
Certifications: (when product is marked)	c-UL-us UL Listed Industrial Control Equipment, certified for US and Canada CE European Union 89/336/EEC EMC Directive, compliant with: EN 61000-6-4; Industrial Emissions EN 50082-2; Industrial Immunity EN 61326; Meas./Control/Lab., Industrial Requirements EN 61000-6-2; Industrial Immunity C- Tick Australian Radiocommunications Act, compliant with: AS/NZS CISPR 11; Industrial Emissions

1. Use this Conductor Category information for planning conductor routing. Refer to Publication A10324, “Industrial Automation Wiring and Grounding Guidelines”.

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Installation & Service Instructions
A10327

Size 0 & Size 00 ISO 15407-2
Interposed Flow Controls

ISSUED: August, 2007
Supersedes: None

⚠WARNING

To avoid unpredictable system behavior that can cause personal injury and property damage:

- **Disconnect electrical supply (when necessary) before installation, servicing, or conversion.**
- **Disconnect air supply and depressurize all air lines connected to this product before installation, servicing, or conversion.**
- **Operate within the manufacturer's specified pressure, temperature, and other conditions listed in these instructions.**
- **Medium must be moisture-free if ambient temperature is below freezing.**
- **Service according to procedures listed in these instructions.**
- **Installation, service, and conversion of these products must be performed by knowledgeable personnel who understand how pneumatic products are to be applied.**
- **After installation, servicing, or conversion, air and electrical supplies (when necessary) should be connected and the product tested for proper function and leakage. If audible leakage is present, or the product does not operate properly, do not put into use.**
- **Warnings and specifications on the product should not be covered by paint, etc. If masking is not possible, contact your local representative for replacement labels.**

Safety Guide

For more complete information on recommended application guidelines, see the Installation Safety Guidelines section of Bulletin 600 (Form A10309) or you can download the Installation Safety Guidelines at: www.rosscontrols.com/rosslit.htm.

⚠ WARNING

FAILURE OR IMPROPER SELECTION OR IMPROPER USE OF THE PRODUCTS AND/OR SYSTEMS DESCRIBED HEREIN OR RELATED ITEMS CAN CAUSE DEATH, PERSONAL INJURY AND PROPERTY DAMAGE.

This document and other information from ROSS CONTROLS, its subsidiaries and authorized distributors provide product and/or system options for further investigation by users having technical expertise. It is important that you analyze all aspects of your application, including consequences of any failure and review the information concerning the product or systems in the current product catalog. Due to the variety of operating conditions and applications for these products or systems, the user, through its own analysis and testing, is solely responsible for making the final selection of the products and systems and assuring that all performance, safety and warning requirements of the application are met.

The products described herein, including without limitation, product features, specifications, designs, availability and pricing, are subject to change by ROSS CONTROLS and its subsidiaries at any time without notice.

EXTRA COPIES OF THESE INSTRUCTIONS ARE AVAILABLE FOR INCLUSION IN EQUIPMENT / MAINTENANCE MANUALS THAT UTILIZE THESE PRODUCTS. CONTACT YOUR LOCAL REPRESENTATIVE.

Introduction

Follow these instructions when installing, operating, or servicing the product.

Installation & Operating Instructions:

An "Interposed" Flow Control controls the flow of air from the valve exhaust ports to atmosphere. The Size 0 & Size 00 4-Way valve is typically used with a double acting cylinder alternately pressurizing one end while exhausting the other. Cylinder speed can be influenced by restricting the exhaust path.

The "Interposed" Flow Control is intended for use with the respective subbase or manifold mounted valves. Size 0 & Size 00 valves and flow controls are designed in conformance to ISO 15407-2. Size 0 & Size 00 Flow Controls are only recommended for use with Common Port versions of Interposed Regulators. The Flow Control is to be assembled between the regulator and the subbase or manifold.

If used with Independent Port version of Interposed Regulator, functionality is limited as follows:

"Interposed" Flow Control used in conjunction with Independent Port version of Interposed Regulator - Adjust speed with the adjusting screw labeled "5". It adjusts the speed of exhaust flow from cylinder ports "2" and "4". Independent speed adjustment is not possible. This could result in different exhaust speeds for cylinder ports "2" and "4" since line pressure is supplied to one cylinder port and a regulated pressure is supplied to the other. The other adjusting screw is non-functional.

Lubrication

Factory Pre-lubed. If lubricating in service, use paraffin based mineral oil with 150 to 200 SSU viscosity @100°F.

⚠ **CAUTION: Do not use oils that are synthetic, reconstituted, have an alcohol content or a detergent additive.**

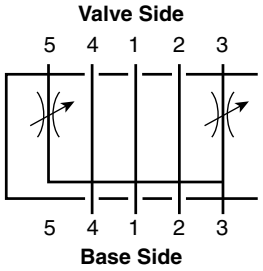
Application Limits:

These products are intended for use in general purpose compressed air systems only.

Operating Pressure Range: Maximum 145 PSIG, 1000kPa

Ambient Temperature Range: -15°C to 49°C (5°F to 120°F)

ANSI Symbol:



Installation:

(See Figure 1, Size 00 Interposed Flow Control shown as example)

⚠ Warning:

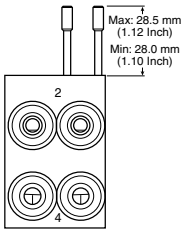
Not following instruction may result in Interposed Fow Control damage or inadequate thread engagement, which may lead to personal injury, property damage, or economic loss.

Important:

- **Remove pressure and electrical connections before installation.**
- **All threads on tie rods and screws must be free of rust, water or other debris, which could prevent finger thread engagement.**

Step 1: Install Tie Rods

1. Install two Tie Rods (6) to the base, torque finger tight.
2. Adjust tie rod height to 28.5/28.0 mm (1.12/1.10 inch) as figure shows.
3. If finger tight height exceeds 28.5 mm (1.12 inch), use mechanical tightening as necessary to get the proper height.



Note: "Base" could be a manifold or a sub-base.

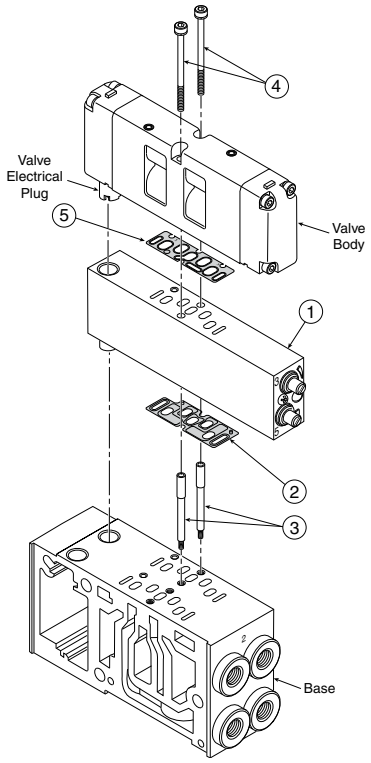


Figure 1 (Size 00 Shown)

Step 2: Install Interposed Flow Control

1. Lay the Interposed Flow Control Gasket (2) on the Base. Make sure the two rubber projections are face up and the orientation of the gasket is correct.
2. Engage both Tie Rods (3) into mounting holes on Flow Control Body, lower the Flow Control body.
3. Carefully engage the Electrical Plug into the Base.
4. Continue to lower the Flow Control Body by carefully engaging the two rubber projections on the gasket into the appropriate holes on the Flow Control Body.
5. Press the Flow Control Body by hand firmly. To confirm the gasket is indeed attached to the Flow Control Body, lift the Flow Control Body by about one half inch. Both rubber projections should remain in the holes.
6. Lay the Flow Control Body back on the Base.

Step 3: Install Valve

1. Locate Valve Gasket (5) on bottom of Valve Body.
2. Install valve onto Flow Control.
3. Carefully engage the Valve Electrical Plug.
4. Using hex wrench, tighten two Screws (4) – torque 1.5 to 1.7 Nm (13 to 15 in-lb) for Size 0, 0.9 to 1.1 Nm (8 to 10 in-lb) for Size 00.

Step 4: Leakage Check

1. Apply pressure to base and check for audible leakage at various joints. If any are present, do not not operate the valve, repeat the assembly procedure until satisfied.

Note: If both a Interposed Flow Control and Interposed Regulator is to be installed, the Flow Control should be installed between the Regulator and the Base. Refer to Interposed Regulator Installation & Service Instructions (A10329) for Interposed Regulator installation.

Adjustment Procedures:

For Size 0 & Size 00

Both Adjusting Screws (4) are located at the 12 End of the assembly. Adjustment screw labeled "5" controls the flow of air from cylinder Port 4 to exhaust Port 5. With a double solenoid valve this occurs when Operator #12 is actuated. With a single solenoid valve this occurs when Operator #14 is not actuated. Adjustment screw labeled "3" controls air from cylinder Port 2 to exhaust Port 3.

1. Turn both adjustment screws clockwise until fully closed and then counterclockwise slightly.
2. While cycling valve with cylinder adjust clockwise to decrease speed or counterclockwise to increase speed.

Component List

The components listed below are for identification purposes only, some of these components are available in various Interposed Flow Control Kits, some are not available due to special factory assembly. Individual components are not sold separately since all kit components should be installed when serviced.

Item	Description
1	Flow Control Body
2	Flow Control / Regulator Gasket
3	Tie Rods
4	Mounting Screws
5	Valve Gasket

Interposed Flow Control Kits

Kit Size	Number	Kit Includes	
		Item # (Qty)	Description
Size 00	RPS5635	1, 2, 3 (2)	18mm Interposed Flow Control Kit with Plug-in (Type 2)
Size 0	RPS5535	1, 2, 3 (2)	26mm Interposed Flow Control Kit with Plug-in (Type 2)
Size 00	RPS5642	1 (Without Elect. Plug), 2, 3 (2)	18mm Interposed Flow Control Kit without Plug-in (Type 1)
Size 0	RPS5542	1 (Without Elect. Plug), 2, 3 (2)	26mm Interposed Flow Control Kit with Plug-in (Type 1)
Size 00	RPS5636	3 (12)	18mm Interposed Flow Control Tie Rod Kit
Size 0	RPS5536	3 (12)	26mm Interposed Flow Control Tie Rod Kit

For all Instruction Sheets, go to www.rosscontrols.com

A10326 - W66 Size 0 (26mm) & W66 Size 00 (18mm) ISO 15407 Valve Service
A10327 - W66 Size 0 & W66 Size 00 ISO 15407-2 Interposed Flow Controls
A10329 - W66 Size 0 & W66 Size 00 Interposed Regulators
A10330 - W66 Size 0 & W66 Size 00 ISO 15407-1 Subbbase & Manifold Installation
A10331 - W65 Size 1, 2 & 3, ISO 5599-1, 5599-2 Subbase & Manifold Installation

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Installation & Service Instructions
A10328

Size 0 & Size 00 ISO 15407-2
Manifold Installation

ISSUED: August, 2007
Supersedes: None

⚠ WARNING

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- **Disconnect electrical supply (when necessary) before installation, servicing, or conversion.**
- **Disconnect air supply and depressurize all air lines connected to this product before installation, servicing, or conversion.**
- **Operate within the manufacturer's specified pressure, temperature, and other conditions listed in these instructions.**
- **Medium must be moisture-free if ambient temperature is below freezing.**
- **Service according to procedures listed in these instructions.**
- **Installation, service, and conversion of these products must be performed by knowledgeable personnel who understand how pneumatic products are to be applied.**
- **After installation, servicing, or conversion, air and electrical supplies (when necessary) should be connected and the product tested for proper function and leakage. If audible leakage is present, or the product does not operate properly, do not put into use.**
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⚠ WARNING

Air exhausting from one valve into the exhaust gallery of the manifold assembly may momentarily pressurize other valve circuits open to the same gallery. Design the circuit such that there is no hazard or consequence of damage from this action.

Introduction

Follow these instructions when installing, operating, or servicing the product.

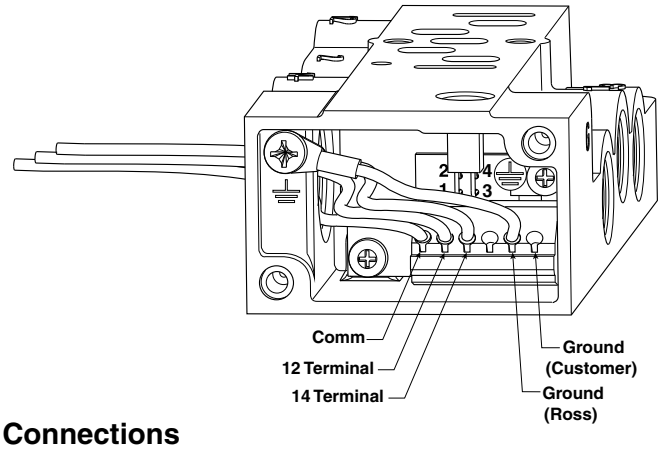
Application Limits

These products are intended for use in general purpose compressed air systems only. Compliance with the rated pressure, temperature, and voltage is necessary - see Installation & Service Instructions packed with valve.

Wiring Instructions for Individual Base Wiring

1. Follow all requirements for local and national electrical codes.
2. Remove end cover from base by backing off the two captive screws.
3. Connect wires as shown in chart.
4. An external ground connection must be attached to the green ground screw of every base in an assembly.
5. Disregard unused wires or terminals.
6. Reassemble cover to base by tightening screws from 0.8 to 1.0 Nm (7 to 9 in-lbs).

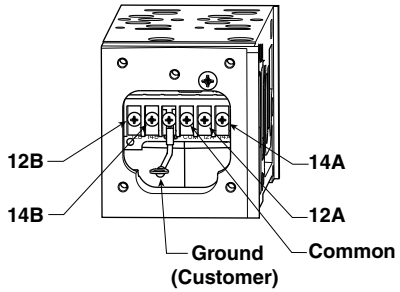
Subbase Wiring

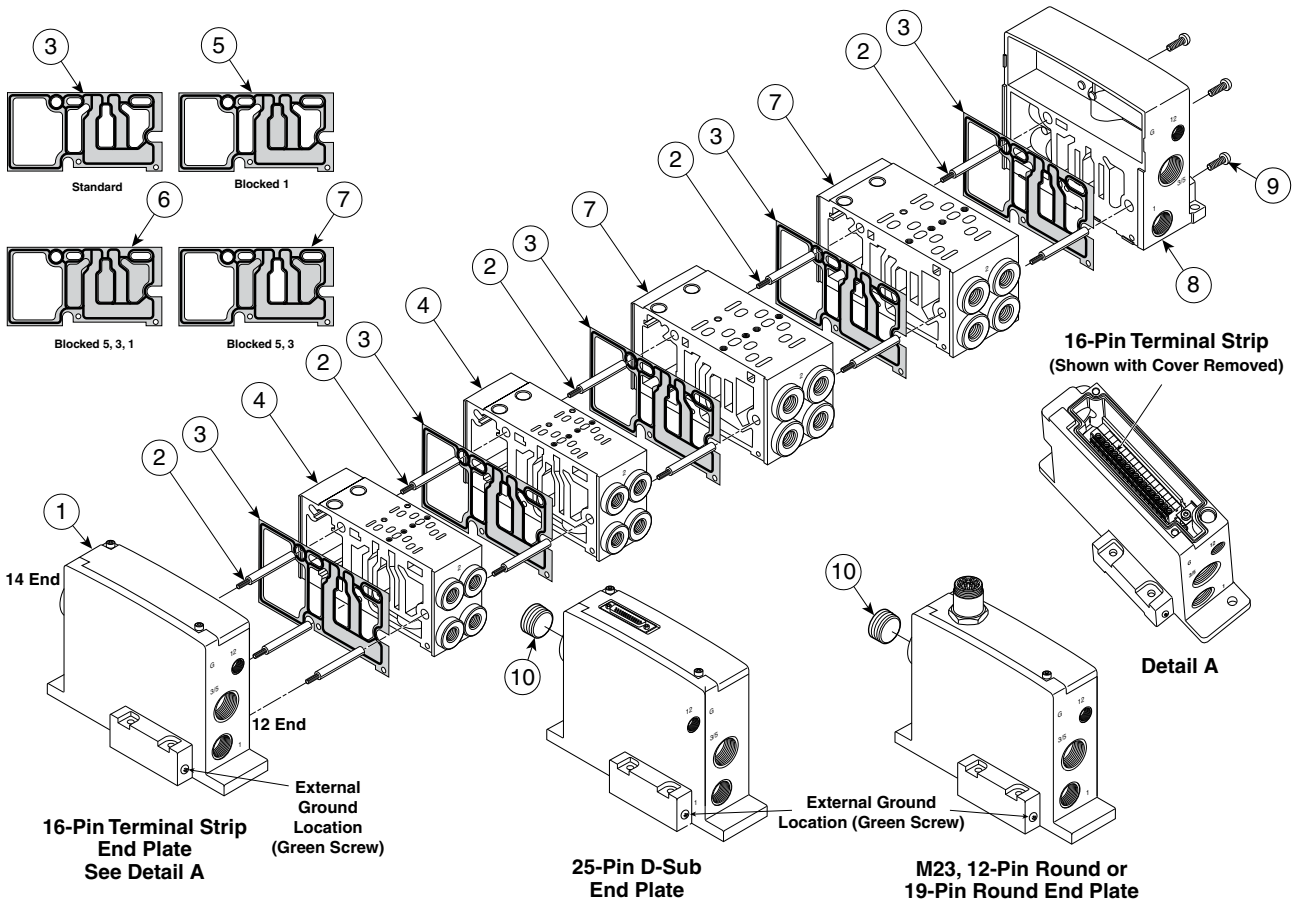


Connections

	14 Solenoid	12 Solenoid
Valves with Wires	Black Wires	Red Wires
Valves with Terminal Block (Will accept 18 to 24 Gauge Wires)	14 and Com Terminals	12 and Com Terminals

Manifold Wiring





Item #	Description	Item #	Description
1	Left End Plate	6	Gasket - Blocked 1, 3, 5
2	Tie Rod (3 per Base)	7	Manifold Base (Size 0)
3	Gasket - Standard	8	Right End Plate
4	Manifold Base (Size 00)	9	Mounting Screws
5	Gasket - Blocked 1	10	Pipe Plug

Assembly Techniques

1. Lay Left Hand End Plate (Item 1) on left side (when looking at cylinder ports).
2. Attach three Tie Rods (Item 2) to the Left End Plate (Item 1) by hand tightening them down completely and then backing off 1-2 turns. Mount the Gasket (Item 3) over the Tie Rods.
3. Add Manifold Base (Item 4). Place 3 Tie Rods (Item 2) through the Base and screw into the Tie Rods mounted in the Left End Plate by hand tightening them down completely and then backing off 1-2 turns.
4. Build manifold vertically by adding remaining Manifolds, Gaskets and Tie Rods.
5. Place Right Hand End Plate and tighten screws to torque specification.
6. Check the manifold for straightness. Loosen and tighten bolts if needed.
7. Add Valves and Accessories. All Manifold Assemblies should be leak tested before operation.

⚠ **Caution: If the socket head cap screws do not engage the last tie rod, it is because the stack of uncompressed gaskets causes the manifolds and gaskets to be longer than the tie rod sets. It will be necessary to lengthen the tie rod sets by backing away each tie rod from its adjacent tie rod about one or two turns. This stack length problem is likely to occur at 6 or 7 manifold bases and worsens with each additional manifold**

Manifold Assembly Wiring Instructions

1. Follow all requirements for local and national electrical codes.
2. An External Ground Connection must be attached to the Manifold Assembly. An external ground location is provided on the Manifold End Plate (See drawing). All 25-Pin, D-Sub versions must use this ground connection. 19-Pin and 16-Pin Terminal Strip versions may omit this connection only if the ground is connected through the connector. Otherwise, the external ground connection location must be used.

Manifold / End Plate Assembly Torque Values

	W66 Size 0 / W66 Size 00
Torque - in.lb. (Nm)	65 to 70 (7.3 to 7.9)

Manifold Kits

Kit Number	Description	Item Number
RPS5612P	Size 00 Manifold Hardware Kit	2
RPS5512P	Size 0 Manifold Hardware Kit	2
RPS561AP	Size 00 / Size 0 Manifold to Manifold Gasket Kit (Standard)	3
RPS561BP	Size 00 / Size 0 Manifold to Manifold Gasket Kit (Blocked #1 Port)	5
RPS561CP	Size 00 / Size 0 Manifold to Manifold Gasket Kit (Blocked #1, 3, 5 Ports)	6
RPS561DP	Size 00 / Size 0 Manifold to Manifold Gasket Kit (Blocked #3, 5 Ports)	7

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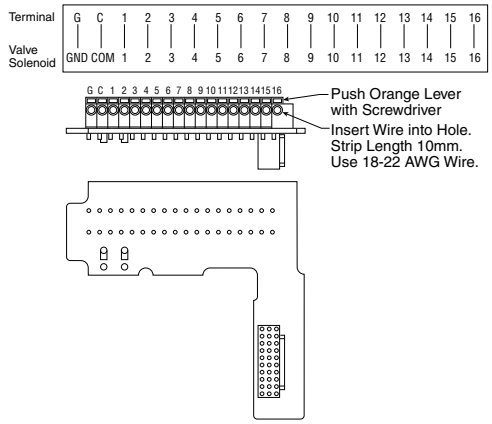
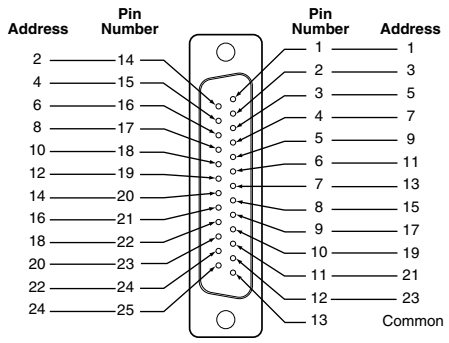
16-Pin Terminal Block

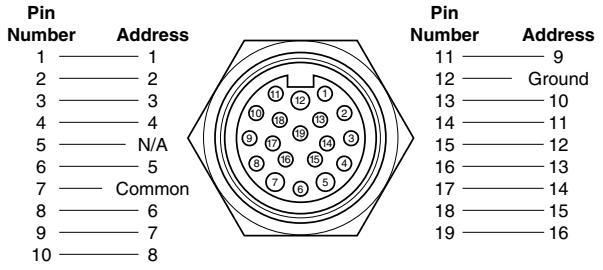

Terminal
G C 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
Valve Solenoid
GND COM 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
Push Orange Lever with Screwdriver
Insert Wire into Hole. Strip Length 10mm. Use 18-22 AWG Wire.

25-Pin, D-Sub Connector (Male)



Face View - Male D-Sub, 25-Pin Connector

19-Pin Round Brad Harrison



Face View - Male 19-Pin Connector

19-Pin Round Cable Specifications

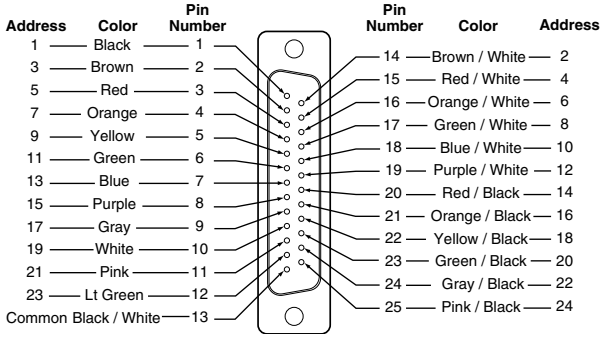
Common Pin "7" is rated for 8 amps. Cable common wire must be greater than total amperage of solenoids on a manidfold assembly.

Example: 8 station manifold, 16 solenoids,
120VAC - 16 x .039 amps = .63 total amp rating.

NEMA 4 rated with properly assembled NEMA 4 rated cable.

Part Number	Description	Length
R333030P80M050	Brad Harrison (Female to Male Cable)	16.40 ft.
R333030P80M100	Brad Harrison (Female to Male Cable)	32.80 ft.

25-Pin, D-Sub Cable (Female)

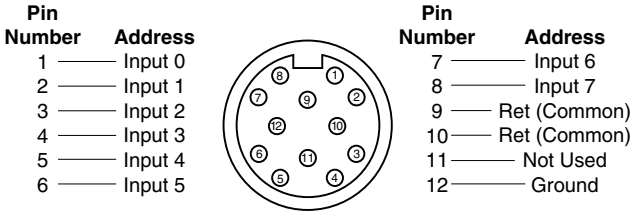


25-Pin, D-Sub Cable Specifications

Common Pin "13" is rated for 3 amps. Common wire rating must be greater than total amperage of all solenoids on a manifold assembly.

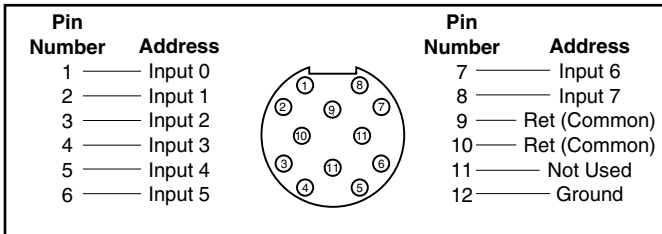
IP65 rated with properly assembled IP65 rated cable.

M23, 12-Pin Round Connector (Male)



Face View - Male M23, 12-Pin Connector

M23, 12-Pin Round Connector (Female)



Face View - Female M23, 12-Pin Connector

For all Instruction Sheets, go to www.rosscontrols.com

A10326 - W66 Size 0 (26mm) & W66 Size 00 (18mm) ISO 15407 Valve Service
A10327 - W66 Size 0 & W66 Size 00 ISO 15407-2 Interposed Flow Controls
A10329 - W66 Size 0 & W66 Size 00 Interposed Regulators
A10330 - W66 Size 0 & W66 Size 00 ISO 15407-1 Subbbase & Manifold Installation
A10331 - W65 Size 1, 2 & 3, ISO 5599-1, 5599-2 Subbase & Manifold Installation

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Installation & Service Instructions
A10331

Size 1, 2 & 3, ISO 5599-1, 5599-2
Subbase & Manifold Installation

ISSUED: August, 2007
Supersedes: None

⚠ WARNING

To avoid unpredictable system behavior that can cause personal injury and property damage:

- **Disconnect electrical supply (when necessary) before installation, servicing, or conversion.**
- **Disconnect air supply and depressurize all air lines connected to this product before installation, servicing, or conversion.**
- **Operate within the manufacturer's specified pressure, temperature, and other conditions listed in these instructions.**
- **Medium must be moisture-free if ambient temperature is below freezing.**
- **Service according to procedures listed in these instructions.**
- **Installation, service, and conversion of these products must be performed by knowledgeable personnel who understand how pneumatic products are to be applied.**
- **After installation, servicing, or conversion, air and electrical supplies (when necessary) should be connected and the product tested for proper function and leakage. If audible leakage is present, or the product does not operate properly, do not put into use.**
- **Warnings and specifications on the product should not be covered by paint, etc. If masking is not possible, contact your local representative for replacement labels.**

Safety Guide

For more complete information on recommended application guidelines, see the Installation Safety Guidelines section of Bulletin 600 (Form A10309) or you can download the Installation Safety Guidelines at: www.rosscontrols.com/rosslit.htm.

⚠ WARNING

FAILURE OR IMPROPER SELECTION OR IMPROPER USE OF THE PRODUCTS AND/OR SYSTEMS DESCRIBED HEREIN OR RELATED ITEMS CAN CAUSE DEATH, PERSONAL INJURY AND PROPERTY DAMAGE.

This document and other information from ROSS CONTROLS, its subsidiaries and authorized distributors provide product and/or system options for further investigation by users having technical expertise. It is important that you analyze all aspects of your application, including consequences of any failure and review the information concerning the product or systems in the current product catalog. Due to the variety of operating conditions and applications for these products or systems, the user, through its own analysis and testing, is solely responsible for making the final selection of the products and systems and assuring that all performance, safety and warning requirements of the application are met.

The products described herein, including without limitation, product features, specifications, designs, availability and pricing, are subject to change by ROSS CONTROLS and its subsidiaries at any time without notice.

EXTRA COPIES OF THESE INSTRUCTIONS ARE AVAILABLE FOR INCLUSION IN EQUIPMENT / MAINTENANCE MANUALS THAT UTILIZE THESE PRODUCTS. CONTACT YOUR LOCAL REPRESENTATIVE.

⚠ WARNING

Air exhausting from one valve into the exhaust gallery of the manifold assembly may momentarily pressurize other valve circuits open to the same gallery. Design the circuit such that there is no hazard or consequence of damage from this action.

Introduction

Follow these instructions when installing, operating, or servicing the product.

Application Limits

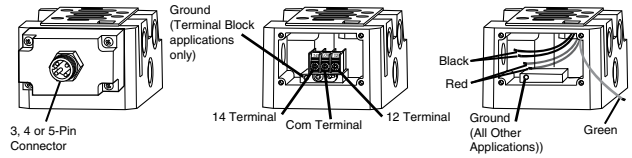
These products are intended for use in general purpose compressed air systems only. Compliance with the rated pressure, temperature, and voltage is necessary - see Installation & Service Instructions packed with valve.

Wiring Instructions for Individual Base Wiring

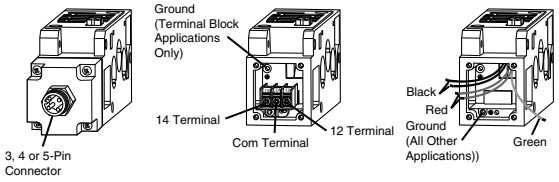
1. Follow all requirements for local and national electrical codes.
2. Remove end cover from base by backing out the two screws.
3. Connect wires as shown in chart.
4. An external ground connection must be attached to the green ground screw of every base in an assembly.
5. Disregard unused wires or terminals.
6. Reassemble cover to base by tightening screws from 0.8 to 1.0 Nm (7 to 9 in-lbs).

Connections

	14 Solenoid	12 Solenoid
Bases with Wires	Black Wires	Red Wires
Bases with Terminal Block (Will accept 18 to 24 Gauge Wires)	14 and Com Terminals	12 and Com Terminals

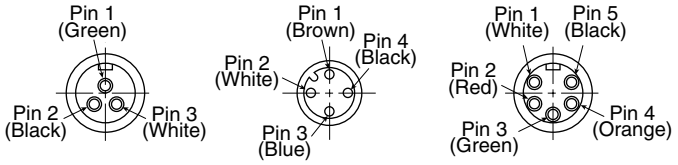


Subbase With Auto C, F, G | **Subbase With Terminal Block** | **Subbase With Wires**



Manifold With Auto C, F, G | **Manifold With Terminal Block** | **Manifold With Wires**

Wiring - Auto C, F, G



3-Pin Mini Enclosure "7" | **4-Pin M12 Enclosure "8"** | **5-Pin Mini Enclosure "9"**

	3-Pin Mini Encl '7'	4-Pin M12 Encl '8'			5-Pin Mini Encl '9'		
Wiring Type	**C, F, G**	**C**	**F**	**G**	**C**	**F**	**G**
Pin #1	Gnd	14	N/A	12	12	14	12
Pin #2	14	Gnd	12	N/A	12	12	14
Pin #3	Com	Com	Com	Com	Gnd	Gnd	Gnd
Pin #4	N/A	12	14	14	14	12	14
Pin #5	N/A	N/A	N/A	N/A	14	14	12

Wiring Instructions for Manifold Interconnect Wiring

⚠ **CAUTION: An interruption of 10 milliseconds or greater to the power supplied to the solenoid of a solenoid operated valve may cause the valve to shift. Provision must be made to prevent power interruption of this duration to avoid unintended, potentially hazardous, consequences.**

For connection simplicity, the Interconnect Wiring System has a single common lead with an amperage limit of 3 amps continuous service. The following chart indicates the upper limit of solenoids that can be energized simultaneously.

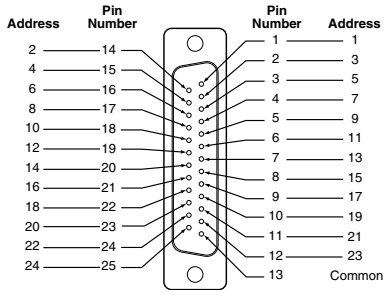
Voltage	25-Pin Code	19-Pin D-Sub	Single Round	12-Pin M23
12VDC	42	13	13	8
24VAC*	42	24	16	8
24VDC	B9	20	16	8
120VAC*	23	24	16	8

* Not CSA certified for 25-Pin, D-Sub option.

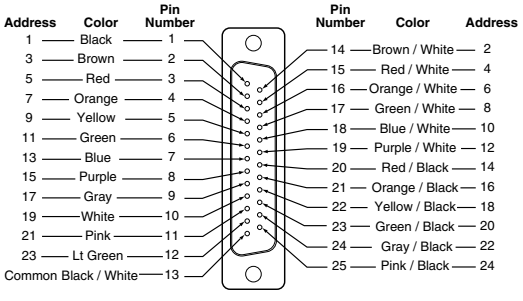
The Interconnect Wiring System has great flexibility to meet user wiring needs. Each manifold base must be ordered with either a single or double address function. The single address circuit board works with single solenoid valves only. The double address circuit board works with both single and double solenoid valves. The end cover of each manifold base is labeled either "Single Address" or "Double Address". Power signals are connected at the 25-Pin D-Sub Collective Wiring Module / Plate (Figure 1), 19-Pin Round Collective Wiring Module / Plate (Figure 2), or 12-Pin Round Collective Wiring Module / Plate (Figure 3). A single address base uses one signal; a double address base uses two signals, the first to the 14 solenoid, the second to the 12 solenoid. Signal usage is sequential through the bases. Any combination of single or double addresses may be used.

25-Pin D-Sub Collective Wiring Module

Common Pin "13" is rated for 3 amps. Common wire rating MUST be greater than total amperage of all solenoids on a manifold assembly.



Face View - Male D-Sub, 25-Pin Connector

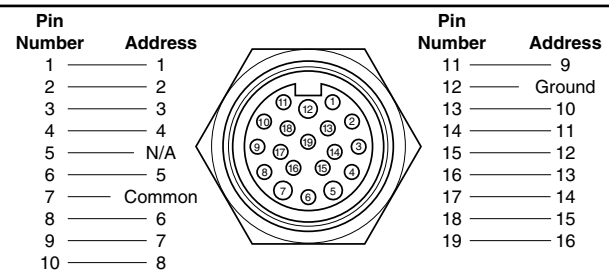

Address
Color
Pin Number
Pin Number
Color
Address
1 — Black — 1
3 — Brown — 2
5 — Red — 3
7 — Orange — 4
9 — Yellow — 5
11 — Green — 6
13 — Blue — 7
15 — Purple — 8
17 — Gray — 9
19 — White — 10
21 — Pink — 11
23 — Lt Green — 12
Common Black / White — 13
14 — Brown / White — 2
15 — Red / White — 4
16 — Orange / White — 6
17 — Green / White — 8
18 — Blue / White — 10
19 — Purple / White — 12
20 — Red / Black — 14
21 — Orange / Black — 16
22 — Yellow / Black — 18
23 — Green / Black — 20
24 — Gray / Black — 22
25 — Pink / Black — 24

Face View -Female D-Sub, 25-Pin Connector

Figure 1

19-Pin Round Collective Wiring Module

Common Pin "7" is rated for 8 amps. Common wire rating MUST be greater than total amperage of all solenoids on a manifold assembly.

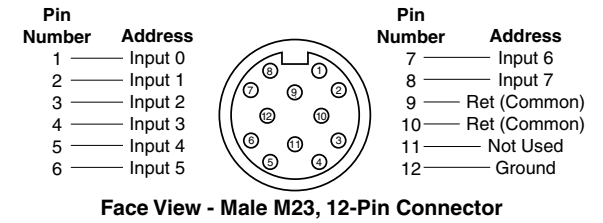


Face View - Male 19-Pin Connector

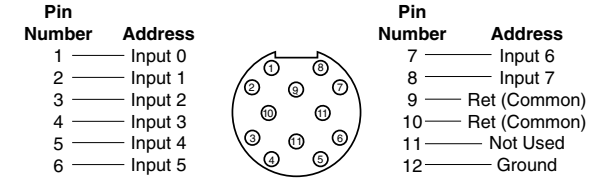
Figure 2

12-Pin Round Collective Wiring Module

Common Pins "9" and "10" are rated for 8 amps. Common wire rating MUST be greater than total amperage of all solenoids on a manifold assembly.



Face View - Male M23, 12-Pin Connector



Face View - Female M23, 12-Pin Connector

Figure 3

Grounding Instructions

The Collective Wiring addressing system is grounded by connecting a **user supplied case wire** to the outside ground screw on the End Plate (Size 1) or the Interface Plate (Size 2 / Size 3). Use 18 gauge, or larger, case wire.

The Collective Wiring 25-Pin D-Sub internal ground is made by connecting the loose ring terminal to the ground screw provided at the internal wire passageway on the Size 1. The Size 2 / Size 3 internal ground connection is the ground screw on the Interface Plate located closer to the wire passageway.

The collective wiring 12-Pin or 19-Pin Round Connector internal ground is made by connecting the lead wire with a ring terminal (ground wire) to the ground screw provided at the internal wire passageway (Size 1) or at the Interface Plate ground screw located closer to the wire passageway.

An earth ground is recommended for all voltages. Follow standard electrical protocol.

Air Piping Assembly

Port Connections:

Manifold stacks / subbases have three common air passage galleries. For Single pressure piping, connect the inlet supply to Port #1; Ports #3 and #5 are then the exhaust ports. For Dual pressure piping, connect the two inlet supplies to Port #3 and Port #5 (it is recommended that the higher pressure be supplied to Port #3); Port #1 is then the exhaust port. See **Manifold**

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Size 1, 2 & 3 Subbase & Manifold Installation

Isolation (Page 8) if the application requires groups of valves with different pressure supplies. Connect the cylinder ports #2 and #4 to the cylinder or other device to be supplied with air from the valve. These ports are at the end (and bottom, if so ordered) of each base.

Note: If Pressure is supplied to one end of a manifold, the pressure port(s) on the opposite end must be plugged.

External Pilot Connections:

An external pilot supply is used when the main inlet pressure is below the minimum valve operating pressure or when the pilot pressure is different from the main inlet pressure. Supply pilot air to either Port #14 or Port #12 and plug the one not being used.

Remote Pilot Signal Connections:

Manifolds:

For remote pilot signal valves, connect the pilot signal to the Remote Pilot Access Plate mounted directly under the valve body. NOTE: Signals into the remote pilot plate do not connect to the #12 or #14 galleries on the End Plates. See Remote Pilot Access Plate instructions.

Subbases:

Connect pilot signal to the #12 and #14 Ports.

Manifold Assembly with Interconnect Wiring

The Interconnect Wiring System (Figure 4 & 5) makes the electrical connection user friendly. Each individual manifold base carries its own connector circuit board which self aligns and plugs into the circuit board of the mating manifold base. The power is supplied at the left end of the stack (as you are viewing the cylinder ports) by means of a plug-in harness or serial module.

The stack assembly is built from left to right (viewing the cylinder ports). Start with the Interconnect Wiring Module Kit and add manifold bases as required. If the stack includes transitions from one valve size to another, the left most size is the smallest and then progressing to successively larger sizes. Follow the techniques described below for the easiest assembly. Consult the torque chart for screw tightening specifications.

For Size 1 Valves (See Figure 4)

1. Lay Interconnect Wiring Plate (Item 1 / 7) port side down (when looking at Manifold Cylinder Ports) and expose the wiring harness. Locate Gasket (Item 2) in place on the Interconnect Wiring Plate (Item 1).
2. Bring the first station Manifold Base to the Interconnect Wiring Plate and plug in the two black connectors from the harness into the base connector circuit board. The connectors are keyed, there is only one assembly possible. Do not twist cables. Attach the Base to the Interconnect Wiring Plate by finger tightening the three Bolts (Item 4). Continue to mount each successive Gasket (Item 2) and Base (Item 3) to the previous Base. Lay the entire manifold on a flat surface, align for straightness and alternately tighten each screw incrementally to torque specifications in the torque chart. Place the right hand End Plate (Item 5) on last base and tighten screws (see torque chart).
3. **NOTE: Transition Plates or Isolation Plugs must be properly placed as the construction of the stack progresses. See individual sections of this bulletin.**
4. Add valves and accessories to the manifold (if not already attached). The final assembly should be leak and electrically tested before operation.

Manifold / End Plate Assembly Torque Values

Torque - in.lb. (Nm)	Item 4	40 to 50 (4.5 to 5.6)

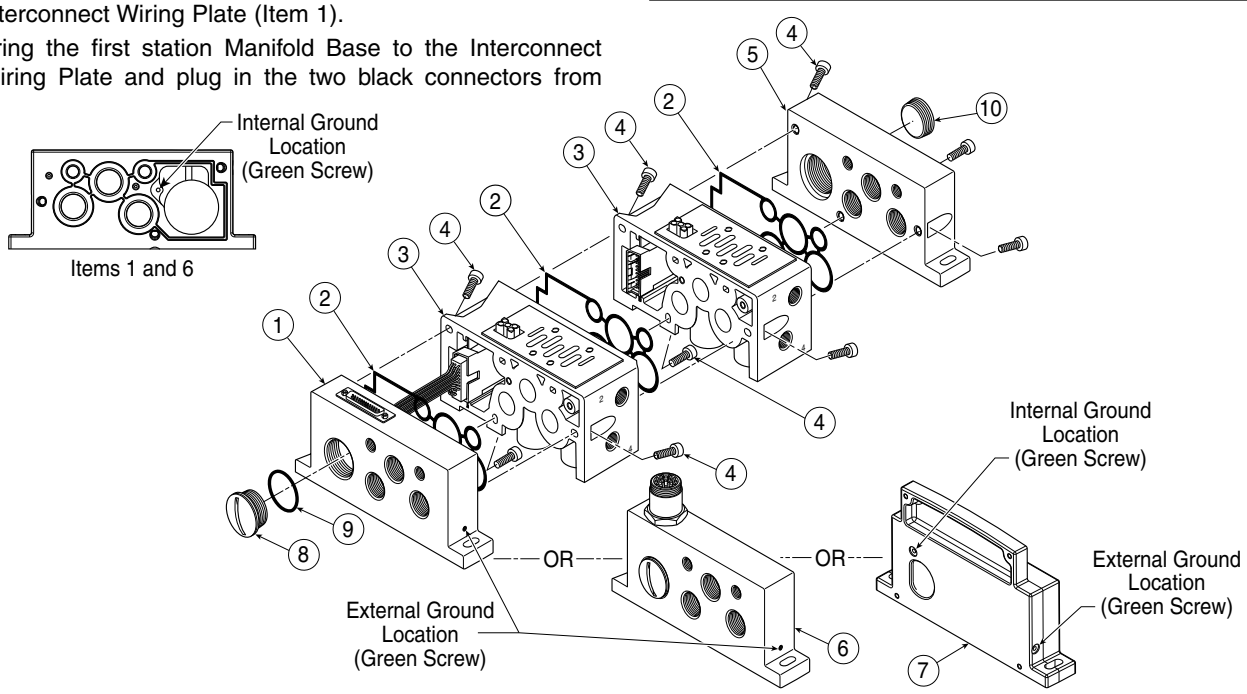

Figure 4 (Size 1 Valves Shown)

Item #	Description
1	Interconnect Wiring Plate (25-Pin, D-Sub Connector)
2	Molded Gasket
3	Manifold Base
4	Mounting Screws
5	Right Hand End Plate

Item #	Description
6	Interconnect Wiring Plate (12 or 19-Pin Connector)
7	Interconnect Wiring Plate (Serial Bus)
8	Dome Plug
9	O-ring
10	Plastic Plug

Size 1, 2 & 3 Subbase & Manifold Installation

For Size 2 & Size 3 Valves (See Figure 5)

1. Attach four Tie Rods (Item 5) to the Interface Plate (Item 7) then mount the Gasket (Item 4), Collective Wiring Module (Item 6), Gasket (Item 4) and Cover (Item 3) over the Tie Rods. Attach these components with the four Screws (Item 1) and Washers (Item 2) provided.

   NOTE: The 25-Pin, D-Sub Collective Wiring Module has a ground wire with ring terminal which must be attached to the inner green screw on the Interface Plate before cover is attached.
2. Lay the Collective Wiring Module port side down and expose the wiring harness. Feed wires into wiring gallery and assemble Collective Wiring Module to Interface Plate. Locate Gasket (Item 8) in place on the Interface Plate (Item 7).
3. Bring the first station Manifold Base (Item 10) to the Interface Plate (Item 7) and plug in the two black connectors from the harness into the base connector circuit board. The connectors are keyed, there is only one assembly possible. Do not twist cables. Tighten the Base to the Interface Plate with the four Bolt / Washers (Item 11) provided with each Base to torque specifications shown in the torque chart. Continue to mount each Molded Track Seal (Item 12) and Base (Item 9) to the previous Base. Lay the entire manifold on a flat surface, align for straightness and alternately tighten each screw incrementally to torque specifications in the torque chart. Place the right hand End Plate (Item 13) on last base and tighten screws (see torque chart).
3. **NOTE: Transition Plates or Isolation Plugs must be properly placed as the construction of the stack progresses. See individual sections of this bulletin.**
4. Add valves and accessories to the manifold (if not already attached). The final assembly should be leak and electrically tested before operation.

Manifold / End Plate Assembly Torque Values

Torque - in.lb. (Nm)	Item 11	195 to 205 (22.0 to 23.2)

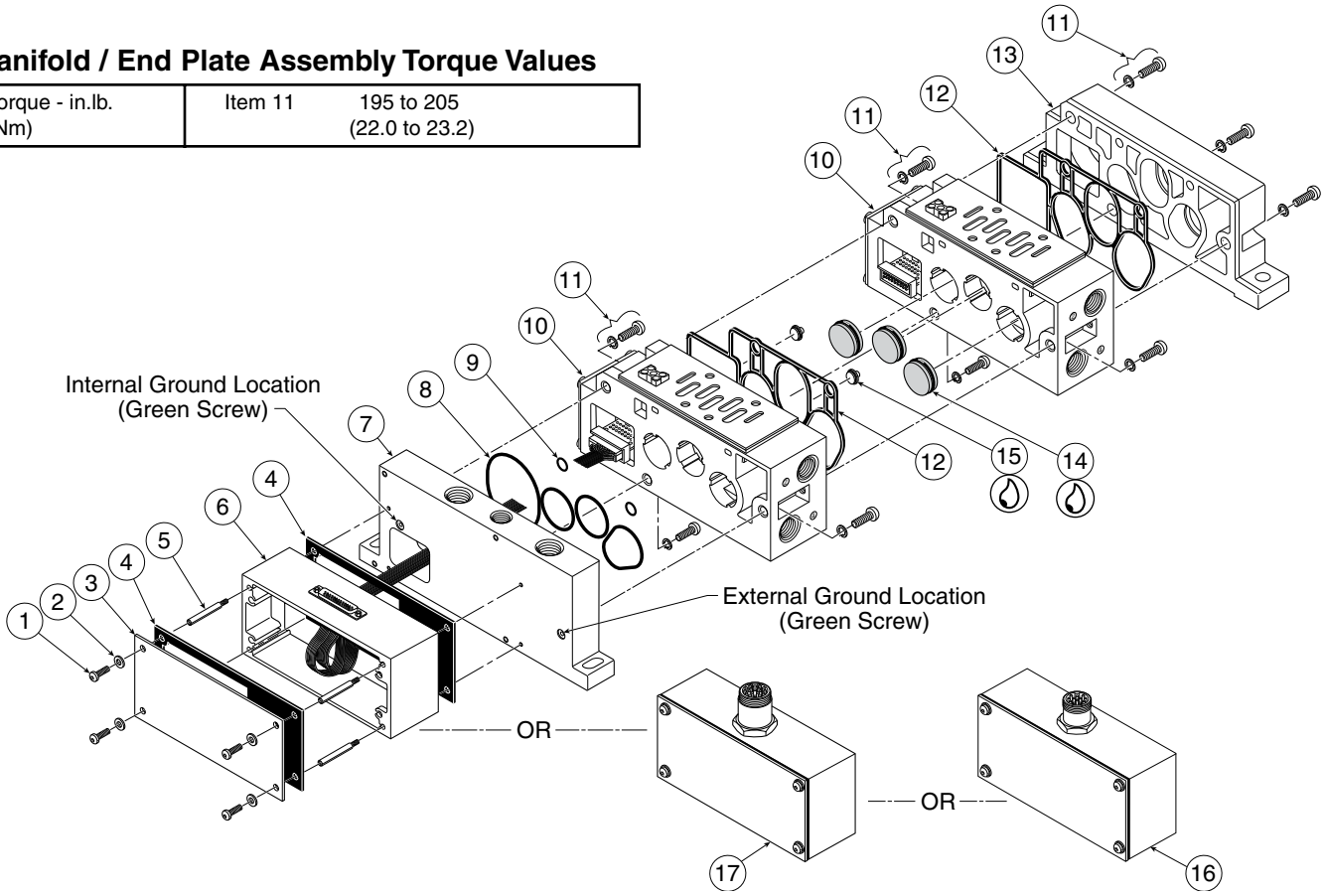

Figure 5 (Size 2 Manifold Assembly Shown)

Item #	Description
1	Cover Screw
2	Cover Washer
3	Collective Wiring Module Cover
4	Collective Wiring Module Gasket
5	Tie Rod
6	Collective Wiring Module (25-Pin, D-Sub)
7	Interface Plate (Top Ported)
8	O-Rings
9	Pilot Gallery O-Rings

Item #	Description
10	Manifold Base (Size 2)
11	Mounting Screw & Lockwasher
12	Molded Gasket
13	Right Hand End Plate
14	Isolation Plugs
15	Pilot Isolation Plug
16	Collective Wiring Module (12-Pin, Round)
17	Collective Wiring Module (19-Pin, Round)

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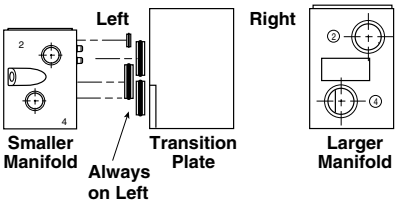
Size 1 to Size 2 Manifold Assembly (See Figure 6)

The smaller manifold must be on the left side of the Transition Plate. The Transition Plate (Item 6) acts as a combination right end plate for the smaller manifold and left end plate for the larger manifold.

1. Lay Left Hand End Plate (when looking at cylinder ports) port side down. Place Gasket in gasket track.
2. Add Station 1 Manifold and tighten all 3 bolts finger tight.
3. Build manifold vertically by adding Gaskets, Isolator Plugs, Transition Plate and remaining Manifolds.
4. Lay entire manifold on a flat surface and tighten screws to torque specification.
5. Place Right Hand End Plate and tighten screws to torque specifications in chart.
6. Add Valves and Accessories. All Manifold Assemblies should be leak tested before operation.

Isolator Plug Locations with Transition Plates



Manifold / End Plate Assembly Torque Values

Torque - in.lb. (Nm)	Item 4	40 to 50 (4.5 to 5.6)
Torque - in.lb. (Nm)	Item 10	195 to 205 (22.0 to 23.2)

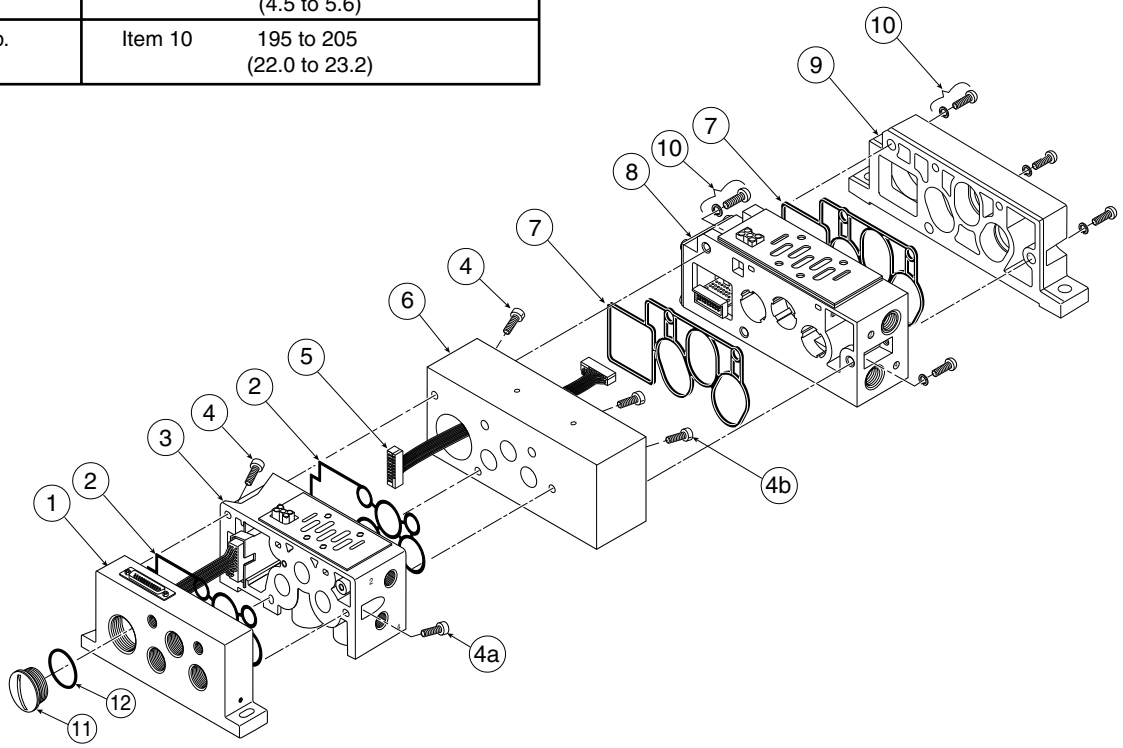


Figure 6 (Size 1 to Size 2 Transition Assembly)

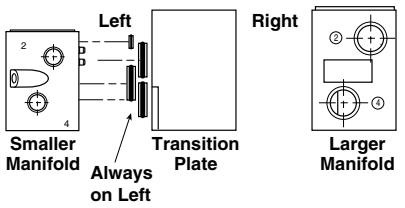
Item #	Description
1	Interconnect Wiring Plate (25-Pin, D-Sub Connector Shown) (Size 1)
2	Manifold Gasket (Size 1)
3	Manifold Base (Size 1)
4a	Mounting Screws (M6 x 16mm)
4b	Mounting Screws (M6 x 25mm)
5	Wire Harness
6	Transition Plate (Size 1 to Size 2)
7	Manifold Gasket (Size 2)
8	Manifold Base (Size 2)
9	Right End Plate (Size 2)
10	Mounting Screws & Lock Washers (Size 2)
11	Dome Plug
12	O-ring

Size 1 to Size 3 Manifold Assembly (See Figure 7)

The smaller manifold must be on the left side of the Transition Plate. The Transition Plate (Item 6) acts as a combination right end plate for the smaller manifold and left end plate for the larger manifold.

1. Lay Left Hand End Plate (when looking at cylinder ports) port side down. Place Gasket in gasket track.
2. Add Station 1 Manifold and tighten all 3 bolts finger tight.
3. Build manifold vertically by adding Gaskets, Isolator Plugs, Transition Plate and remaining Manifolds.
4. Lay entire manifold on a flat surface and tighten screws to torque specification.
5. Place Right Hand End Plate and tighten screws to torque specifications in chart.
6. Add Valves and Accessories. All Manifold Assemblies should be leak tested before operation.

Isolator Plug Locations with Transition Plates



Manifold / End Plate Assembly Torque Values

Torque - in.lb. (Nm)	Item 4	40 to 50 (4.5 to 5.6)
Torque - in.lb. (Nm)	Item 10	195 to 205 (22.0 to 23.2)

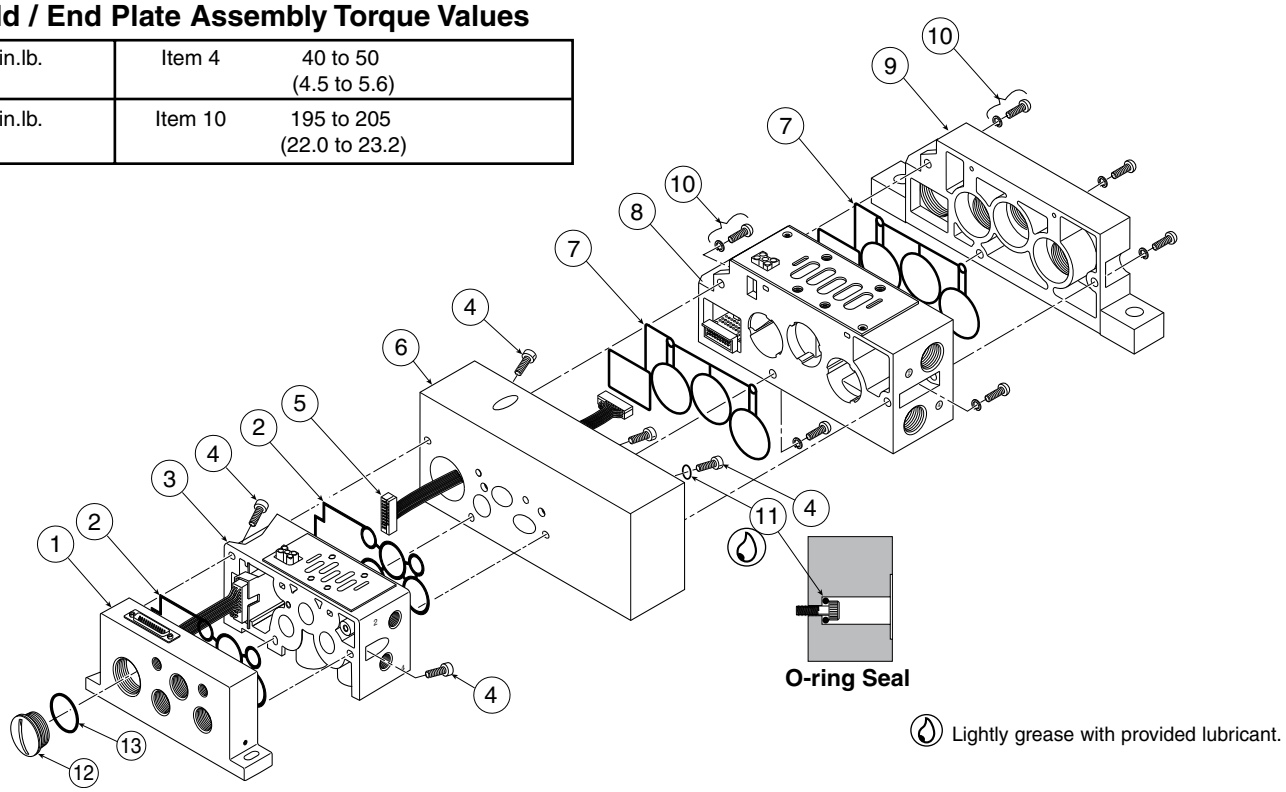


Figure 7 (Size 1 to Size 3 Transition Assembly)

Item #	Description
1	Interconnect Wiring Plate (25-Pin, D-Sub Connector Shown) (Size 1)
2	Manifold Gasket (Size 1)
3	Manifold Base (Size 1)
4	Mounting Screws (Size 1)
5	Wire Harness
6	Transition Plate (Size 1 to Size 3)
7	Manifold Gasket (Size 3)
8	Manifold Base (Size 3)
9	Right End Plate (Size 3)
10	Mounting Screws & Lock Washers (Size 3)
11	O-ring Seal Washer
12	Dome Plug
13	O-Ring

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Size 2 to Size 3 Manifold Assembly (See Figure 8)

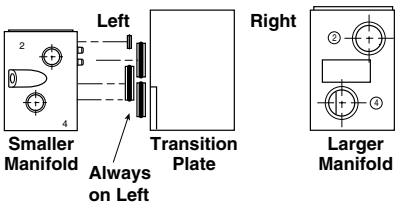
The smaller manifold must be on the left side of the Transition Plate. The Transition Plate (Item 14) acts as a combination right end plate for the smaller manifold and left end plate for the larger manifold.

1. Lay Interface Plate (Item 7) with O-ring channels facing up. Place O-rings in correct channels.
2. Add Station 1 Manifold and tighten all 3 bolts finger tight.
3. Build manifold vertically by adding Gaskets, Isolator Plugs, Transition Plate and remaining Manifolds.
4. Lay entire manifold on a flat surface and tighten screws to torque specification.
5. Place Right Hand End Plate and tighten screws to torque specifications in chart.
6. Assemble Collective Wiring Module (Items 1 through 6) to Interface Plate (Item 7).
7. Add Valves and Accessories. All Manifold Assemblies should be leak tested before operation.

Manifold / End Plate Assembly Torque Values

Torque - in.lb. (Nm)	Item 12	195 to 205 (22.0 to 23.2)

Isolator Plug Locations with Transition Plates



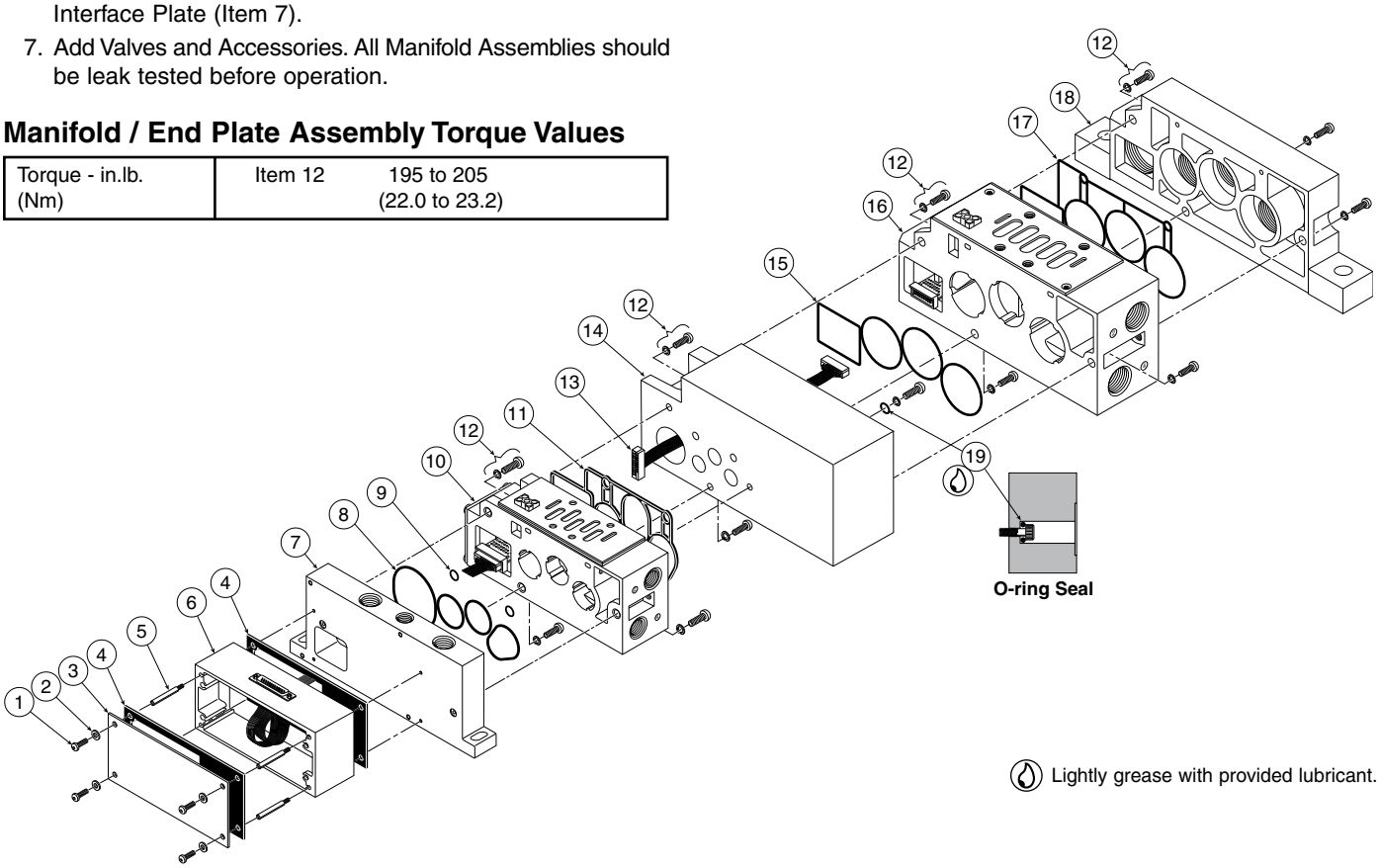


Figure 8 (Size 2 to Size 3 Transition Assembly)

Item #	Description
1	Cover Screw
2	Cover Washer
3	Collective Wiring Module Cover
4	Collective Wiring Module Gasket
5	Tie Rod
6	Collective Wiring Module (25-Pin, D-Sub)
7	Interface Plate (Top Ported)
8	O-Rings
9	Pilot Gallery O-Rings
10	Manifold Base (Size 2)

Item #	Description
11	Manifold Base Gasket (Size 2)
12	Mounting Screws & Lock Washers (Size 2 & Size 3)
13	Wire Harness
14	Transition Plate (Size 2 to Size 3)
15	Manifold to Transition Plate Gasket (Size 3)
16	Manifold Base (Size 3)
17	Manifold to Transition Plate Gasket (Size 3)
18	Right End Plate (Size 3)
19	O-ring Seal Washer

Manifold Isolation Assembly

Inlet & exhaust galleries, and pilot supply / signal galleries may be isolated from those in adjacent manifolds through the use of isolation plugs. Note: air piloted valves, whether single or double, will need to be isolated at 14 and / or 12 galleries to prevent improper air pressure signals reaching adjacent valves. Figure 9 indicates typical assembly locations of the Main Gallery Plugs (Item 1) and the Pilot Gallery Plugs (Item 2).

The following describes how to install plugs:

1. Determine which gallery is to be isolated between two manifolds.
2. Use the large Plugs (Item 1) from the service kits to isolate manifolds from the main gallery(s).
3. Apply a light coating of grease to isolation plug and insert it into counterbore of left manifold base.
4. Apply a light coating of grease to Gasket (Item 3) and assemble in manifold groove.
5. Assemble plugged manifold into manifold bank in its proper position.
6. Apply main pressure and check for leaks. If any are present, do not operate the valve - repeat the reassembly process until satisfactory.

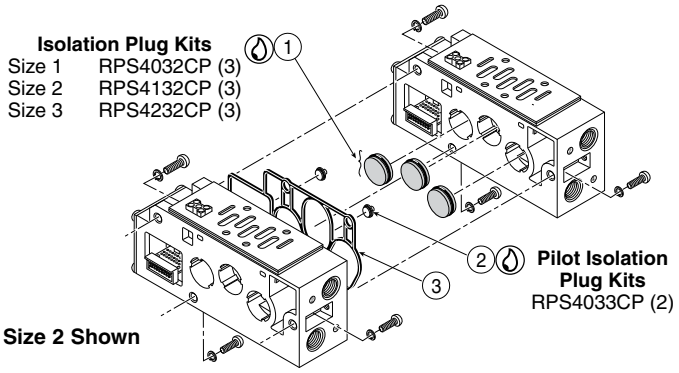
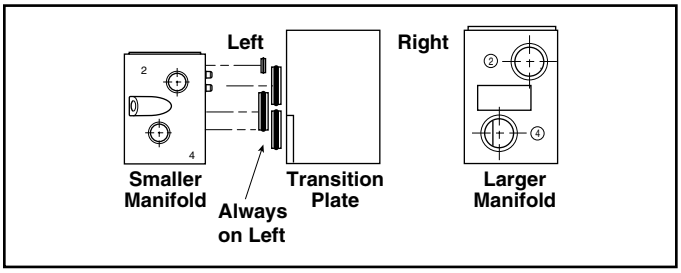


Figure 9

Isolator Plug Locations with Transition Plates



Hi-Flow Manifold Repair Kits

Kit Number	Description (Qty.)	Item Number
RPS4012P	Size 1 Manifold to Manifold Screws (3)	3
RPS4013P	Size 1 Manifold to Manifold Gasket (1)	2
RPS4112P	Size 2 / Size 3 Manifold to Manifold Screws and Washers (12)	10
RPS4113P	Size 2 Manifold to Manifold Gasket (1)	12
RPS4213P	Size 3 Manifold to Manifold Gasket (1)	12

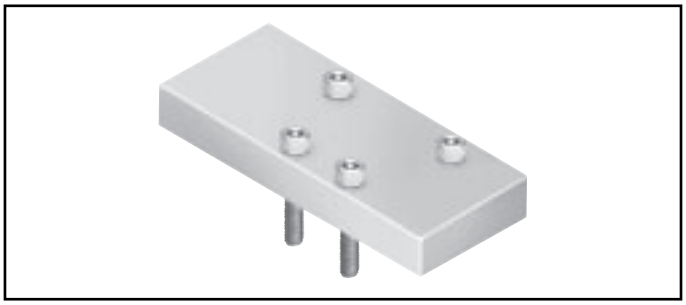
Station Blanking Plate

Use top Blanking Plate on a Manifold to reserve a place for a valve that will be added later to the manifold bank or to remove a valve from a manifold without having to remove the manifold block from the manifold bank.

Place Gasket and Blanking Plate on Manifold and assemble using Mounting Screws provided with kit. Tighten screws to torque specifications shown in the torque chart below.

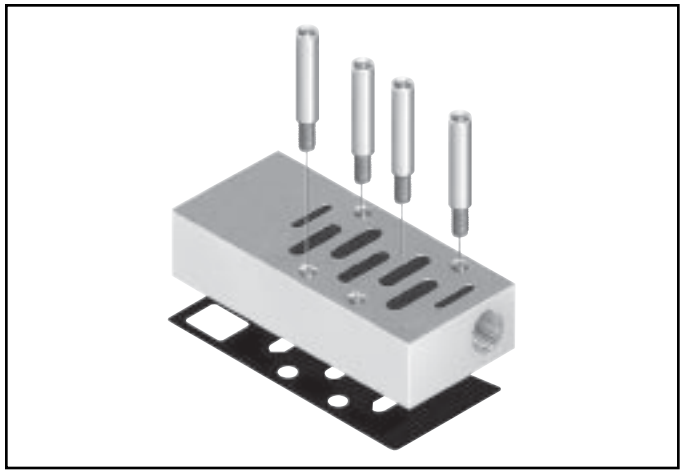
Apply main pressure and check for leaks. If any are present, do not operate valves on the manifold bank - repeat the assembly process until satisfactory.

Valve Series	Size 1	Size 2	Size 3
Torque - in. lb. (Nm)	25 to 35 (2.8 to 3.9)	115 to 130 (12.9 to 14.7)	120 to 140 (13.6 to 15.8)



Remote Pilot Access Plate

The Remote Pilot Access Plate provides access to the #12 and #14 valve pilot galleys for a Size 1, Size 2 & Size 3 manifold. It is required for Single or Double Remote Pilot Valves on a manifold. Hand tighten the tie rods into the base.



For all Instruction Sheets, go to www.rosscontrols.com

A10326 - W66 Size 0 (26mm) & W66 Size 00 (18mm) ISO 15407 Valve Service
A10327 - W66 Size 0 & W66 Size 00 ISO 15407-2 Interposed Flow Controls
A10329 - W66 Size 0 & W66 Size 00 Interposed Regulators
A10330 - W66 Size 0 & W66 Size 00 ISO 15407-1 Subbbase & Manifold Installation
A10331 - W65 Size 1, 2 & 3, ISO 5599-1, 5599-2 Subbase & Manifold Installation

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Installation & Service Instructions
A10314

Serial Bus PROFIBUS Adapter, Series A (RPSSCPBA)

ISSUED: August, 2007
Supersedes: None

⚠WARNING

To avoid unpredictable system behavior that can cause personal injury and property damage:

- **Disconnect electrical supply (when necessary) before installation, servicing, or conversion.**
- **Disconnect air supply and depressurize all air lines connected to this product before installation, servicing, or conversion.**
- **Operate within the manufacturer's specified pressure, temperature, and other conditions listed in these instructions.**
- **Medium must be moisture-free if ambient temperature is below freezing.**
- **Service according to procedures listed in these instructions.**
- **Installation, service, and conversion of these products must be performed by knowledgeable personnel who understand how pneumatic products are to be applied.**
- **After installation, servicing, or conversion, air and electrical supplies (when necessary) should be connected and the product tested for proper function and leakage. If audible leakage is present, or the product does not operate properly, do not put into use.**
- **Warnings and specifications on the product should not be covered by paint, etc. If masking is not possible, contact your local representative for replacement labels.**

Safety Guide

For more complete information on recommended application guidelines, see the Installation Safety Guidelines section of Bulletin 600 (Form A10309) or you can download the Installation Safety Guidelines at: www.rosscontrols.com/rosslit.htm.

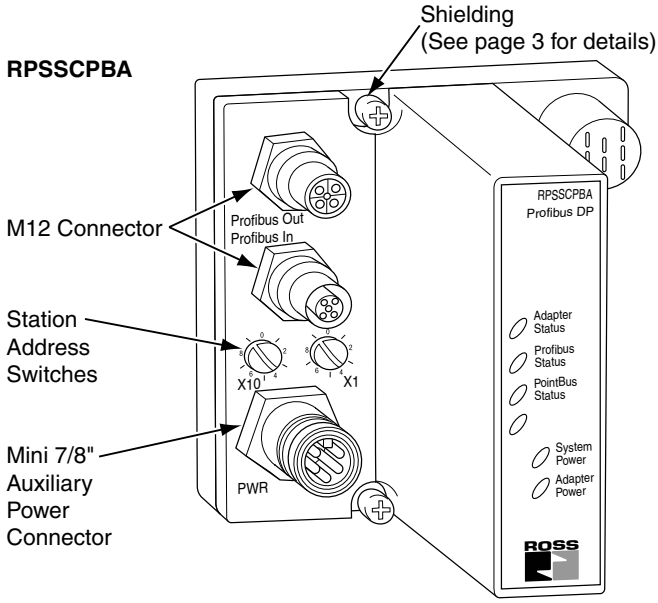
Introduction

Follow these instructions when installing, operating, or servicing the product.

Serial Bus PROFIBUS Adapter, Series A

(RPSSCPBA)

The sealed IP67 housing of these adapters requires no enclosure. (Note that environmental requirements other than IP67 may require an additional appropriate housing.) PROFIBUS connectors are sealed M12 (micro) style. The PROFIBUS adapter is shown below.



Serial Bus PROFIBUS Adapter User Manual

The Serial Bus PROFIBUS Adapter User Manual is not available at this time. Please refer to Rockwell Automation 1734 POINT I/O PROFIBUS Adapter User Manual 1734-UM005B-EN-P for similar setup information, which is available online at http://literature.rockwellautomation.com/.

⚠ WARNING

FAILURE OR IMPROPER SELECTION OR IMPROPER USE OF THE PRODUCTS AND/OR SYSTEMS DESCRIBED HEREIN OR RELATED ITEMS CAN CAUSE DEATH, PERSONAL INJURY AND PROPERTY DAMAGE.

This document and other information from ROSS CONTROLS, its subsidiaries and authorized distributors provide product and/or system options for further investigation by users having technical expertise. It is important that you analyze all aspects of your application, including consequences of any failure and review the information concerning the product or systems in the current product catalog. Due to the variety of operating conditions and applications for these products or systems, the user, through its own analysis and testing, is solely responsible for making the final selection of the products and systems and assuring that all performance, safety and warning requirements of the application are met.

The products described herein, including without limitation, product features, specifications, designs, availability and pricing, are subject to change by ROSS CONTROLS and its subsidiaries at any time without notice.

EXTRA COPIES OF THESE INSTRUCTIONS ARE AVAILABLE FOR INCLUSION IN EQUIPMENT / MAINTENANCE MANUALS THAT UTILIZE THESE PRODUCTS. CONTACT YOUR LOCAL REPRESENTATIVE.

Important User Information

Solid state equipment has operational characteristics differing from those of electromechanical equipment. *Safety Guidelines for the Application, Installation and Maintenance of Solid State Controls (Form A10325)* (available online at www.rosscontrols.com/rosslit.htm), describes some important differences between solid state equipment and hard-wired electromechanical devices. Because of these differences, and also because of the wide variety of uses for solid state equipment, all persons responsible for applying this equipment must satisfy themselves that each intended application of this equipment is acceptable.

In no event will ROSS CONTROLS® be responsible or liable for indirect or consequential damages to persons or property resulting from the use or application of this equipment.

The examples and diagrams in this manual are included solely for illustrative purposes. Because of the many variables and requirements associated with any particular installation, ROSS CONTROLS cannot assume responsibility or liability for actual use based on the examples and diagrams.

No patent liability is assumed by ROSS CONTROLS with respect to use of information, circuits, equipment, or software described in this manual.

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Throughout this manual we use notes to make you aware of safety considerations.

WARNING	Identifies information about practices or circumstances that can cause an explosion in a hazardous environment, which may lead to personal injury or death, property damage, or economic loss.
IMPORTANT	Identifies information that is critical for successful application and understanding of the product.
ATTENTION	Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss. Attentions help you: • Identify a Hazard • Avoid a Hazard • Recognize the Consequence
SHOCK HAZARD	Labels may be located on or inside the equipment to alert people that dangerous voltage may be present.
BURN HAZARD	Labels may be located on or inside the equipment to alert people that surfaces may be dangerous temperatures.

ATTENTION

Environment and Enclosure

This equipment is intended for use in overvoltage Category II applications (as defined in IEC publication 60664-1), at altitudes up to 2000 meters without derating. This equipment is considered Group 1, Class A industrial equipment according to IEC/CISPR Publication 11. Without appropriate precautions, there may be potential difficulties ensuring electromagnetic compatibility in other environments due to conducted as well as radiated disturbance. This equipment is supplied as “enclosed” equipment. It should not require additional system enclosure when used in locations consistent with the enclosure type ratings stated in the Specifications section of this publication. Subsequent sections of this publication may contain additional information regarding specific enclosure type ratings, beyond what this product provides, that are required to comply with certain product safety certifications.

NOTE: See NEMA Standards publication 250 and IEC publication 60529, as applicable, for explanations of the degrees of protection provided by different types of enclosure. Also, see the appropriate sections in this publication, as well as the publication A10324 (“Industrial Automation Wiring and Grounding Guidelines”), for additional installation requirements pertaining to this equipment.

ATTENTION

Preventing Electrostatic Discharge

This equipment is sensitive to electrostatic discharge, which can cause internal damage and affect normal operation. Follow these guidelines when you handle this equipment:

- Touch a grounded object to discharge potential static.
- Wear an approved grounding wrist strap.
- Do not touch connectors or pins on component boards.
- Do not touch circuit components inside the equipment.
- If available, use a static-safe workstation.
- When not in use, store the equipment in appropriate static-safe packaging.

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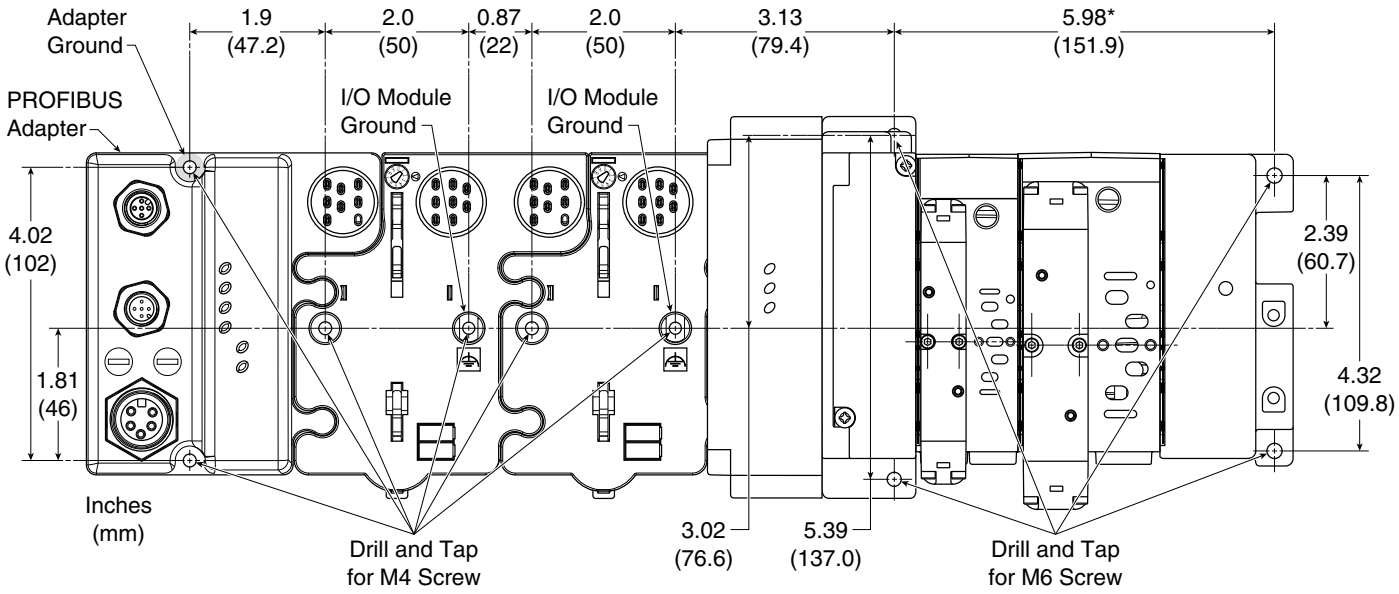
Mount the Adapter and I/O Base

To mount the adapter on a wall or panel, use the screw holes provided in the adapter.

A mounting illustration for the adapter with I/O bases is shown below.



*Depending on the type and number of manifolds, this dimension may vary. Consult Ross for specific information.

Install the Mounting Base as Follows:

1. Lay out the required points as shown above in the drilling dimension drawing.
2. Drill the necessary holes for #8 (M4) machine or self-tapping screws.
3. Mount the adapter using #8 (M4) screws.
4. Ground the system using the ground lug connection in the I/O base. (The ground lug connection is also a mounting hole.)

Grounding and Shielding

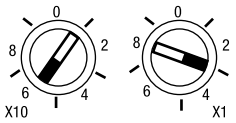
Grounding: Each Serial Bus base has two mounting holes, with the one on the right being the means to ground each module. Each module must be grounded.

Shielding: For PROFIBUS adapter, both PROFIBUS IN and PROFIBUS OUT metal shells are connected to the top screw hole metal ring. Shielded PROFIBUS cordsets are required to help reduce the effects of electrical noise coupling. One example of such a cordset is Brad Harrison's “360° Shielded Head” cordset, which can be found at www.connector.com. For more Grounding and Shielding information, please refer to A10324, “Industrial Automation Wiring and Grounding Guidelines”.

Set the Station Address

To set the station address, adjust the switches on the front of the module (refer to the illustration on page 1). Use a small blade screwdriver to rotate the switches. Line up the small notch on the switch with the number setting you wish to use. The two switches are most significant digit (MSD) and least significant digit (LSD). The switches can be set from 01 through 99. The module reads the switches at power-up only.

This example shows the node address set at 63.



GSD File Requirements

Current functionality of a PROFIBUS adapter requires a GSD file. The file is easy to install and is available online at: www.rosscontrols.com/rosslit.htm.

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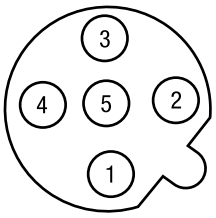
Wire the PROFIBUS Adapter

Following are wiring instructions for the PROFIBUS Adapter.

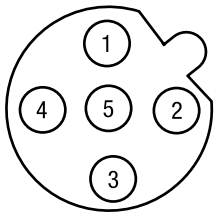
RPSSCPBA (Micro M12, B - Coding Reverse Key)

Male In Connector



(view into connector)
Pin 1 - +5VBUS
Pin 2 - A-Line
Pin 3 - GNDBUS
Pin 4 - B-Line
Pin 5 - Not Used

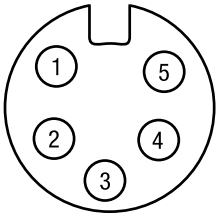
Female Out Connector



Note: Please refer to page 3, Mount the Adapter and I/O Base, for shielding information.

RPSSCPBA Male Auxiliary (Mini 7/8")

Male In Connector



(view into connector)
Pin 1 - User Power -
Pin 2 - Adapter Power -
Pin 3 - Protective GND
Pin 4 - Adapter Power +
Pin 5 - User Power +

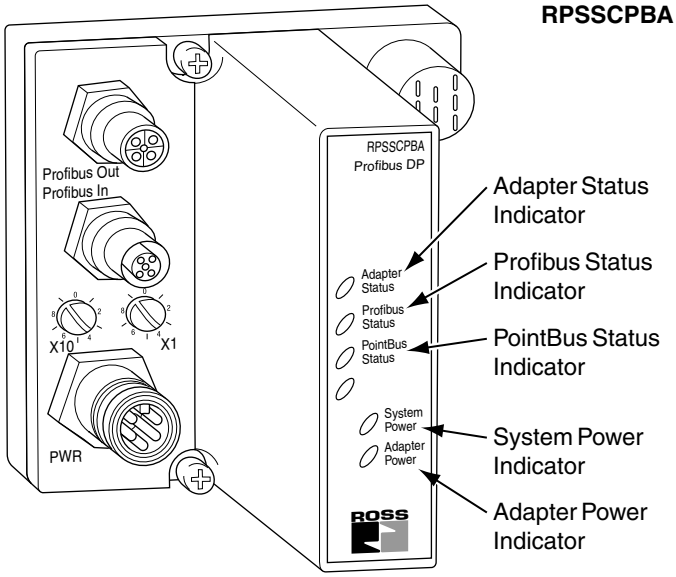
NOTE: User power is the 24VDC power for field devices.

Adapter power is the 24VDC power for adapter. It is converted to 5VDC to power Serial Bus modules.

ATTENTION

Make sure all connectors and caps are securely tightened to properly seal the connections against leaks and maintain IP67 requirements.

Troubleshoot with the Indicators



RPSSCPBA

Indication	Probable Cause
Adapter Status	
Off	No power supplied Hardware check in progress Initialization in progress
Green	Operating normally
Red	Hardware check fault

Indication	Probable Cause
Profibus Status	
Off	No power supplied Bus is off line
Green	Bus is on line (data exchange)
Flashing Green	Adapter has received a CLEAR command from the master
Red	Error in PROFIBUS initialization. No modules installed in the backplane.
Flashing Red	1Hz: - Check_Configuration telegram rejected. - Maximum number of I/O modules in master configuration overridden. 2Hz: - SetPrm telegram rejected. - The first byte in user parameter data does not equal zero. - Maximum number of user parameter bytes overridden.

Indication	Probable Cause
PointBus Status	
Off	No power supplied Hardware check in progress Initialization in progress
Green	Normal operation
Flashing Red	1Hz: - Incorrect I/O module installed. - I/O module removed from backplane.
Red	Critical link failure (BUS_OFF).

Indication	Probable Cause
System Power*	
Off	Not active field. Power is off, overloaded backplane or dc-dc converter problem.
Green	System power (5V) present.

Indication	Probable Cause
Adapter Power**	
Off	Field power not applied.
Green	Field power (24V) applied.

* System Power Indicator shows the 5V power output from the dc-dc converter.

** Adapter Power Indicator shows the 24V power input to the dc-dc converter.

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Specifications

Following are specifications for the RPSSCPBA PROFIBUS adapter.

PROFIBUS Adapter - RPSSCPBA	
Expansion I/O Capacity	• PROFIBUS adapter backplane current output = 1.0A maximum. See the list below for backplane current consumption for each I/O catalog number and the current consumption for each of the modules connected to the PROFIBUS adapter. Verify that it is below 1.0A. • Backplane current can be extended beyond 1.0A with a RPSSSE24A Backplane Extension Power Supply. The RPSSSE24A can supply up to an additional 1.3A of backplane current. • Multiple RPSSSE24A modules can be used to reach the maximum of 63 modules. **Cat. No.** — **PointBus Current Requirements** RPSSN8xxx — 75 mA RPSSP8xxx — 75 mA RPSST8xxx — 75 mA RPSSTR4M12A — 90 mA RPSSNACM12A — 75 mA RPSSNAVM12A — 75 mA RPSSTACM12A — 75 mA RPSSTAVM12A — 75 mA RPSSS23A — 75 mA RPSSV32A — 75 mA
Power Supply Specifications	
Power Supply	**Note:** In order to comply with CE Low Voltage Directives (LVD), you must use either a NEC Class 2, a Safety Extra Low Voltage (SELV) or a Protected Extra Low Voltage (PELV) power supply to power this adapter. A SELV supply cannot exceed 30V rms, 42.4V peak or 60VDC under normal conditions and under single fault conditions. A PELV supply has the same rating and is connected to protected earth.
Input Voltage Rating	24VDC nominal 10-28.8VDC range
Input Overvoltage Protection	Reverse polarity protected
Inrush Current	6A maximum for 10ms
PointBus Output Current	1A maximum @ 5VDC ±5% (4.75-5.25
Field Side Power Requirements, Maximum	24VDC (+20% = 28.8VDC) @ 400 mA
Interruption	Output voltage will stay within specifications when input drops out for 10ms at 10V with maximum load
General Specifications	
LED Indicators	1 green/red Adapter status 1 green/red PROFIBUS status 1 green/red PointBus status 1 green System Power (PointBus 5V power) 1 green Adapter Power (24V from field supply)
Power Consumption, Maximum	8.1W @ 28.8VDC
Power Dissipation, Maximum	2.8W @ 28.8VDC
Thermal Dissipation, Maximum	9.5 BTU/hr. @ 28.8VDC
Isolation Voltage (continuous-voltage withstand rating)	50V rms Tested at 1250VAC rms for 60s
Field Power Bus Nominal Voltage Supply Voltage Supply Current	 24VDC 10-28.8VDC range 10A maximum
Dimensions Inches (Millimeters)	4.41H x 2.83W x 2.56D (112H x 72W x 65D)

General Specifications (continued)	
Operating Temperature	IEC 60068-2-1 (Test Ad, Operating Cold), IEC 60068-2-2 (Test Bd, Operating Dry Heat), IEC 60068-2-14 (Test Nb, Operating Thermal Shock): -20 to 60°C (-4 to 140°F)
Storage Temperature	IEC 60068-2-1 (Test Ab, Un-packaged Non-operating Cold), IEC 60068-2-2 (Test Bb, Un-packaged Non-operating Dry Heat), -40 to 85°C (-40 to 185°F)
Relative Humidity	IEC 60068-2-30 (Test Db, Un-packaged Non-operating Damp Heat): 5-95% non-condensing
Shock	IEC60068-2-27 (Test Ea, Unpackaged Shock): Operating 30g Non-operating 50g
Vibration	IEC60068-2-6 (Test Fc, Operating): 5g @ 10-500Hz
ESD Immunity	IEC 61000-4-2: 6kV contact discharges 8kV air discharges
Radiated RF Immunity	IEC 61000-4-3: 10V/m with 1kHz sine-wave 80%AM from 30MHz to 2000MHz 10V/m with 200Hz 50% Pulse 100%AM at 900Mhz 10V/m with 200Hz 50% Pulse 100%AM at 1890Mhz
EFT/B Immunity	IEC 61000-4-4: ±4kV at 5kHz on power ports ±2kV at 5kHz on communications ports
Surge Transient Immunity	IEC 61000-4-5: ±1kV line-line(DM) and ±2kV line-earth(CM) on power ports ±2kV line-earth(CM) on shielded ports
Conducted RF Immunity	IEC 61000-4-6: 10Vrms with 1kHz sine-wave 80%AM from 150kHz to 80MHz
Emissions	CSPR 11: Group 1, Class A
Enclosure Type Rating	Meets IP65/66/67 (when marked)
Mounting Base Screw Torque	#8 screw, 7.5 in. lbs. in Aluminum, 16 in. lbs. in Steel
Wiring Category[1]	1 - on power ports 1 - on communications ports
Weight Imperial (Metric)	0.80 lb. (0.36 kg)
Certifications: (when product is marked)	c-UL-us UL Listed Industrial Control Equipment, certified for US and Canada CE European Union 89/336/EEC EMC Directive, compliant with: EN 61000-6-4; Industrial Emissions EN 50082-2; Industrial Immunity EN 61326; Meas./Control/Lab., Industrial Requirements EN 61000-6-2; Industrial Immunity C-Tick Australian Radiocommunications Act, compliant with: AS/NZS CISPR 11; Industrial Emissions

1. Use this Conductor Category information for planning conductor routing. Refer to Publication A10324, “Industrial Automation Wiring and Grounding Guidelines”.

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Installation & Service Instructions
A10314

Serial Bus PROFIBUS Adapter, Series A (RPSSCPBA)

ISSUED: August, 2007
Supersedes: None

⚠WARNING

To avoid unpredictable system behavior that can cause personal injury and property damage:

- **Disconnect electrical supply (when necessary) before installation, servicing, or conversion.**
- **Disconnect air supply and depressurize all air lines connected to this product before installation, servicing, or conversion.**
- **Operate within the manufacturer's specified pressure, temperature, and other conditions listed in these instructions.**
- **Medium must be moisture-free if ambient temperature is below freezing.**
- **Service according to procedures listed in these instructions.**
- **Installation, service, and conversion of these products must be performed by knowledgeable personnel who understand how pneumatic products are to be applied.**
- **After installation, servicing, or conversion, air and electrical supplies (when necessary) should be connected and the product tested for proper function and leakage. If audible leakage is present, or the product does not operate properly, do not put into use.**
- **Warnings and specifications on the product should not be covered by paint, etc. If masking is not possible, contact your local representative for replacement labels.**

Safety Guide

For more complete information on recommended application guidelines, see the Installation Safety Guidelines section of Bulletin 600 (Form A10309) or you can download the Installation Safety Guidelines at: www.rosscontrols.com/rosslit.htm.

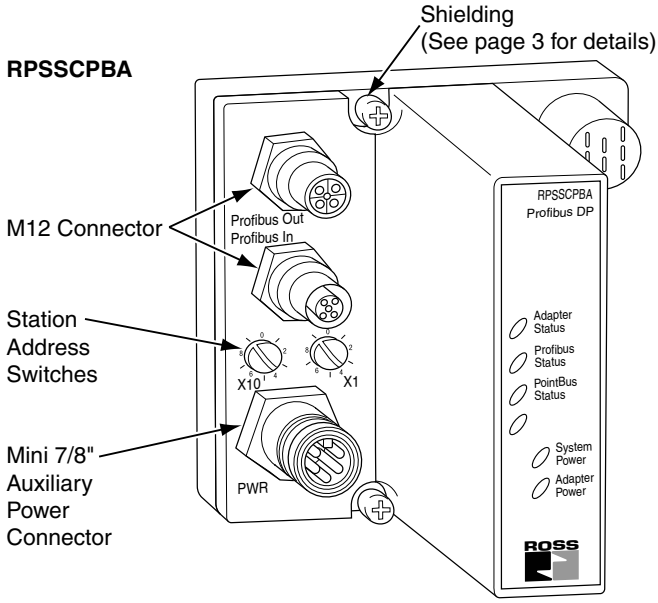
Introduction

Follow these instructions when installing, operating, or servicing the product.

Serial Bus PROFIBUS Adapter, Series A

(RPSSCPBA)

The sealed IP67 housing of these adapters requires no enclosure. (Note that environmental requirements other than IP67 may require an additional appropriate housing.) PROFIBUS connectors are sealed M12 (micro) style. The PROFIBUS adapter is shown below.



Serial Bus PROFIBUS Adapter User Manual

The Serial Bus PROFIBUS Adapter User Manual is not available at this time. Please refer to Rockwell Automation 1734 POINT I/O PROFIBUS Adapter User Manual 1734-UM005B-EN-P for similar setup information, which is available online at http://literature.rockwellautomation.com/.

⚠ WARNING

FAILURE OR IMPROPER SELECTION OR IMPROPER USE OF THE PRODUCTS AND/OR SYSTEMS DESCRIBED HEREIN OR RELATED ITEMS CAN CAUSE DEATH, PERSONAL INJURY AND PROPERTY DAMAGE.

This document and other information from ROSS CONTROLS, its subsidiaries and authorized distributors provide product and/or system options for further investigation by users having technical expertise. It is important that you analyze all aspects of your application, including consequences of any failure and review the information concerning the product or systems in the current product catalog. Due to the variety of operating conditions and applications for these products or systems, the user, through its own analysis and testing, is solely responsible for making the final selection of the products and systems and assuring that all performance, safety and warning requirements of the application are met.

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WARNING	Identifies information about practices or circumstances that can cause an explosion in a hazardous environment, which may lead to personal injury or death, property damage, or economic loss.
IMPORTANT	Identifies information that is critical for successful application and understanding of the product.
ATTENTION	Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss. Attentions help you: • Identify a Hazard • Avoid a Hazard • Recognize the Consequence
SHOCK HAZARD	Labels may be located on or inside the equipment to alert people that dangerous voltage may be present.
BURN HAZARD	Labels may be located on or inside the equipment to alert people that surfaces may be dangerous temperatures.

ATTENTION

Environment and Enclosure

This equipment is intended for use in overvoltage Category II applications (as defined in IEC publication 60664-1), at altitudes up to 2000 meters without derating. This equipment is considered Group 1, Class A industrial equipment according to IEC/CISPR Publication 11. Without appropriate precautions, there may be potential difficulties ensuring electromagnetic compatibility in other environments due to conducted as well as radiated disturbance. This equipment is supplied as “enclosed” equipment. It should not require additional system enclosure when used in locations consistent with the enclosure type ratings stated in the Specifications section of this publication. Subsequent sections of this publication may contain additional information regarding specific enclosure type ratings, beyond what this product provides, that are required to comply with certain product safety certifications.

NOTE: See NEMA Standards publication 250 and IEC publication 60529, as applicable, for explanations of the degrees of protection provided by different types of enclosure. Also, see the appropriate sections in this publication, as well as the publication A10324 (“Industrial Automation Wiring and Grounding Guidelines”), for additional installation requirements pertaining to this equipment.

ATTENTION

Preventing Electrostatic Discharge

This equipment is sensitive to electrostatic discharge, which can cause internal damage and affect normal operation. Follow these guidelines when you handle this equipment:

- Touch a grounded object to discharge potential static.
- Wear an approved grounding wrist strap.
- Do not touch connectors or pins on component boards.
- Do not touch circuit components inside the equipment.
- If available, use a static-safe workstation.
- When not in use, store the equipment in appropriate static-safe packaging.

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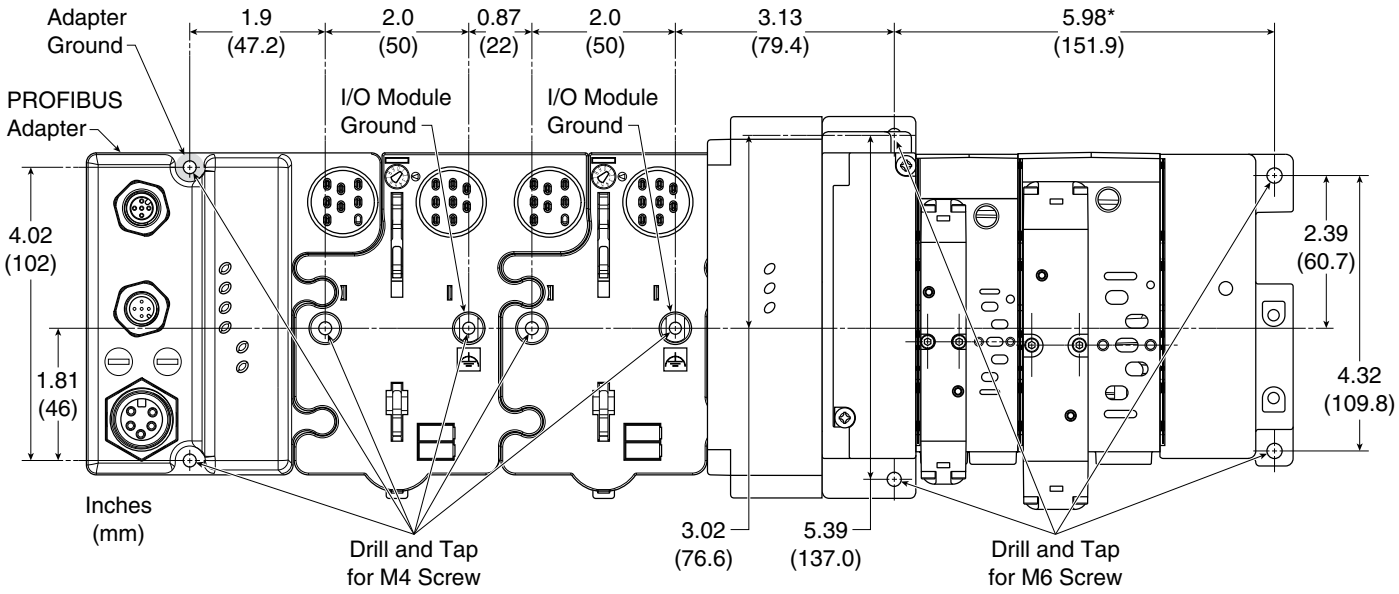
Mount the Adapter and I/O Base

To mount the adapter on a wall or panel, use the screw holes provided in the adapter.

A mounting illustration for the adapter with I/O bases is shown below.



*Depending on the type and number of manifolds, this dimension may vary. Consult Ross for specific information.

Install the Mounting Base as Follows:

1. Lay out the required points as shown above in the drilling dimension drawing.
2. Drill the necessary holes for #8 (M4) machine or self-tapping screws.
3. Mount the adapter using #8 (M4) screws.
4. Ground the system using the ground lug connection in the I/O base. (The ground lug connection is also a mounting hole.)

Grounding and Shielding

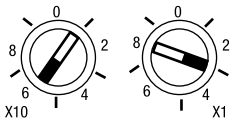
Grounding: Each Serial Bus base has two mounting holes, with the one on the right being the means to ground each module. Each module must be grounded.

Shielding: For PROFIBUS adapter, both PROFIBUS IN and PROFIBUS OUT metal shells are connected to the top screw hole metal ring. Shielded PROFIBUS cordsets are required to help reduce the effects of electrical noise coupling. One example of such a cordset is Brad Harrison's “360° Shielded Head” cordset, which can be found at www.connector.com. For more Grounding and Shielding information, please refer to A10324, “Industrial Automation Wiring and Grounding Guidelines”.

Set the Station Address

To set the station address, adjust the switches on the front of the module (refer to the illustration on page 1). Use a small blade screwdriver to rotate the switches. Line up the small notch on the switch with the number setting you wish to use. The two switches are most significant digit (MSD) and least significant digit (LSD). The switches can be set from 01 through 99. The module reads the switches at power-up only.

This example shows the node address set at 63.



GSD File Requirements

Current functionality of a PROFIBUS adapter requires a GSD file. The file is easy to install and is available online at: www.rosscontrols.com/rosslit.htm.

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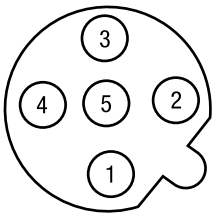
Wire the PROFIBUS Adapter

Following are wiring instructions for the PROFIBUS Adapter.

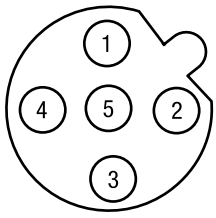
RPSSCPBA (Micro M12, B - Coding Reverse Key)

Male In Connector



(view into connector)
Pin 1 - +5VBUS
Pin 2 - A-Line
Pin 3 - GNDBUS
Pin 4 - B-Line
Pin 5 - Not Used

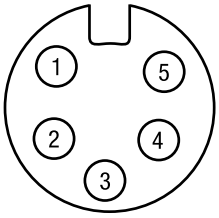
Female Out Connector



Note: Please refer to page 3, Mount the Adapter and I/O Base, for shielding information.

RPSSCPBA Male Auxiliary (Mini 7/8")

Male In Connector



(view into connector)
Pin 1 - User Power -
Pin 2 - Adapter Power -
Pin 3 - Protective GND
Pin 4 - Adapter Power +
Pin 5 - User Power +

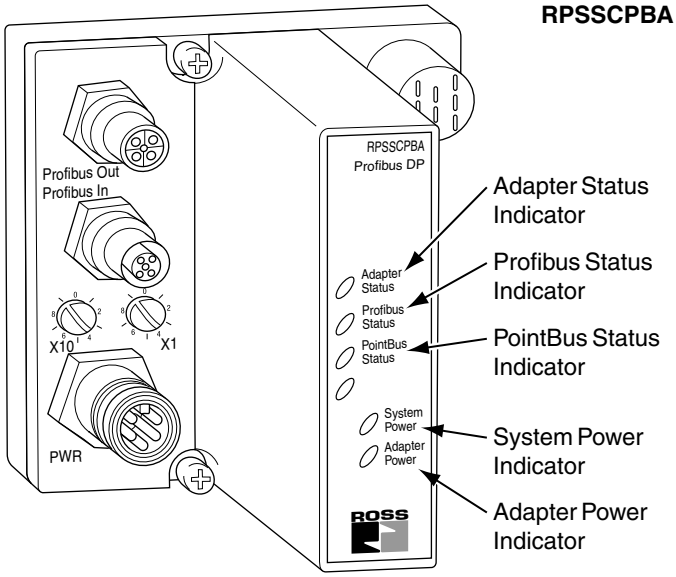
NOTE: User power is the 24VDC power for field devices.

Adapter power is the 24VDC power for adapter. It is converted to 5VDC to power Serial Bus modules.

ATTENTION

Make sure all connectors and caps are securely tightened to properly seal the connections against leaks and maintain IP67 requirements.

Troubleshoot with the Indicators



RPSSCPBA

Indication	Probable Cause
Adapter Status	
Off	No power supplied Hardware check in progress Initialization in progress
Green	Operating normally
Red	Hardware check fault

Indication	Probable Cause
Profibus Status	
Off	No power supplied Bus is off line
Green	Bus is on line (data exchange)
Flashing Green	Adapter has received a CLEAR command from the master
Red	Error in PROFIBUS initialization. No modules installed in the backplane.
Flashing Red	1Hz: - Check_Configuration telegram rejected. - Maximum number of I/O modules in master configuration overridden. 2Hz: - SetPrm telegram rejected. - The first byte in user parameter data does not equal zero. - Maximum number of user parameter bytes overridden.

Indication	Probable Cause
PointBus Status	
Off	No power supplied Hardware check in progress Initialization in progress
Green	Normal operation
Flashing Red	1Hz: - Incorrect I/O module installed. - I/O module removed from backplane.
Red	Critical link failure (BUS_OFF).

Indication	Probable Cause
System Power*	
Off	Not active field. Power is off, overloaded backplane or dc-dc converter problem.
Green	System power (5V) present.

Indication	Probable Cause
Adapter Power**	
Off	Field power not applied.
Green	Field power (24V) applied.

* System Power Indicator shows the 5V power output from the dc-dc converter.

** Adapter Power Indicator shows the 24V power input to the dc-dc converter.

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Specifications

Following are specifications for the RPSSCPBA PROFIBUS adapter.

PROFIBUS Adapter - RPSSCPBA	
Expansion I/O Capacity	• PROFIBUS adapter backplane current output = 1.0A maximum. See the list below for backplane current consumption for each I/O catalog number and the current consumption for each of the modules connected to the PROFIBUS adapter. Verify that it is below 1.0A. • Backplane current can be extended beyond 1.0A with a RPSSSE24A Backplane Extension Power Supply. The RPSSSE24A can supply up to an additional 1.3A of backplane current. • Multiple RPSSSE24A modules can be used to reach the maximum of 63 modules. **Cat. No.** — **PointBus Current Requirements** RPSSN8xxx — 75 mA RPSSP8xxx — 75 mA RPSST8xxx — 75 mA RPSSTR4M12A — 90 mA RPSSNACM12A — 75 mA RPSSNAVM12A — 75 mA RPSSTACM12A — 75 mA RPSSTAVM12A — 75 mA RPSSS23A — 75 mA RPSSV32A — 75 mA
Power Supply Specifications	
Power Supply	**Note:** In order to comply with CE Low Voltage Directives (LVD), you must use either a NEC Class 2, a Safety Extra Low Voltage (SELV) or a Protected Extra Low Voltage (PELV) power supply to power this adapter. A SELV supply cannot exceed 30V rms, 42.4V peak or 60VDC under normal conditions and under single fault conditions. A PELV supply has the same rating and is connected to protected earth.
Input Voltage Rating	24VDC nominal 10-28.8VDC range
Input Overvoltage Protection	Reverse polarity protected
Inrush Current	6A maximum for 10ms
PointBus Output Current	1A maximum @ 5VDC ±5% (4.75-5.25
Field Side Power Requirements, Maximum	24VDC (+20% = 28.8VDC) @ 400 mA
Interruption	Output voltage will stay within specifications when input drops out for 10ms at 10V with maximum load
General Specifications	
LED Indicators	1 green/red Adapter status 1 green/red PROFIBUS status 1 green/red PointBus status 1 green System Power (PointBus 5V power) 1 green Adapter Power (24V from field supply)
Power Consumption, Maximum	8.1W @ 28.8VDC
Power Dissipation, Maximum	2.8W @ 28.8VDC
Thermal Dissipation, Maximum	9.5 BTU/hr. @ 28.8VDC
Isolation Voltage (continuous-voltage withstand rating)	50V rms Tested at 1250VAC rms for 60s
Field Power Bus Nominal Voltage Supply Voltage Supply Current	 24VDC 10-28.8VDC range 10A maximum
Dimensions Inches (Millimeters)	4.41H x 2.83W x 2.56D (112H x 72W x 65D)

General Specifications (continued)	
Operating Temperature	IEC 60068-2-1 (Test Ad, Operating Cold), IEC 60068-2-2 (Test Bd, Operating Dry Heat), IEC 60068-2-14 (Test Nb, Operating Thermal Shock): -20 to 60°C (-4 to 140°F)
Storage Temperature	IEC 60068-2-1 (Test Ab, Un-packaged Non-operating Cold), IEC 60068-2-2 (Test Bb, Un-packaged Non-operating Dry Heat), -40 to 85°C (-40 to 185°F)
Relative Humidity	IEC 60068-2-30 (Test Db, Un-packaged Non-operating Damp Heat): 5-95% non-condensing
Shock	IEC60068-2-27 (Test Ea, Unpackaged Shock): Operating 30g Non-operating 50g
Vibration	IEC60068-2-6 (Test Fc, Operating): 5g @ 10-500Hz
ESD Immunity	IEC 61000-4-2: 6kV contact discharges 8kV air discharges
Radiated RF Immunity	IEC 61000-4-3: 10V/m with 1kHz sine-wave 80%AM from 30MHz to 2000MHz 10V/m with 200Hz 50% Pulse 100%AM at 900Mhz 10V/m with 200Hz 50% Pulse 100%AM at 1890Mhz
EFT/B Immunity	IEC 61000-4-4: ±4kV at 5kHz on power ports ±2kV at 5kHz on communications ports
Surge Transient Immunity	IEC 61000-4-5: ±1kV line-line(DM) and ±2kV line-earth(CM) on power ports ±2kV line-earth(CM) on shielded ports
Conducted RF Immunity	IEC 61000-4-6: 10Vrms with 1kHz sine-wave 80%AM from 150kHz to 80MHz
Emissions	CSPR 11: Group 1, Class A
Enclosure Type Rating	Meets IP65/66/67 (when marked)
Mounting Base Screw Torque	#8 screw, 7.5 in. lbs. in Aluminum, 16 in. lbs. in Steel
Wiring Category[1]	1 - on power ports 1 - on communications ports
Weight Imperial (Metric)	0.80 lb. (0.36 kg)
Certifications: (when product is marked)	c-UL-us UL Listed Industrial Control Equipment, certified for US and Canada CE European Union 89/336/EEC EMC Directive, compliant with: EN 61000-6-4; Industrial Emissions EN 50082-2; Industrial Immunity EN 61326; Meas./Control/Lab., Industrial Requirements EN 61000-6-2; Industrial Immunity C-Tick Australian Radiocommunications Act, compliant with: AS/NZS CISPR 11; Industrial Emissions

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Installation & Service Instructions
A10320

Serial Bus Relay Output Module, Series A (RPSSTR4M12A)

ISSUED: August, 2007
Supersedes: None

⚠ WARNING

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Introduction

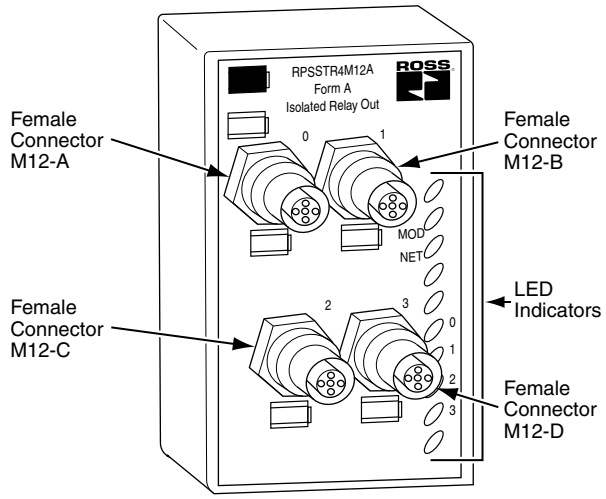
Follow these instructions when installing, operating, or servicing the product.

Serial Bus Relay Output Module, Series A

(RPSSTR4M12A)

The sealed IP67 housing of the module requires no enclosure. (Note that environmental requirements other than IP67 may require an additional appropriate housing.) I/O connectors are sealed M12 (micro) style. The mounting base ships with the module. The RPSSTR4M12A module is shown below.

RPSSTR4M12A



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- Wear an approved grounding wrist strap.
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- Do not touch circuit components inside the equipment.
- If available, use a static-safe workstation.
- When not in use, store the equipment in appropriate static-safe packaging.

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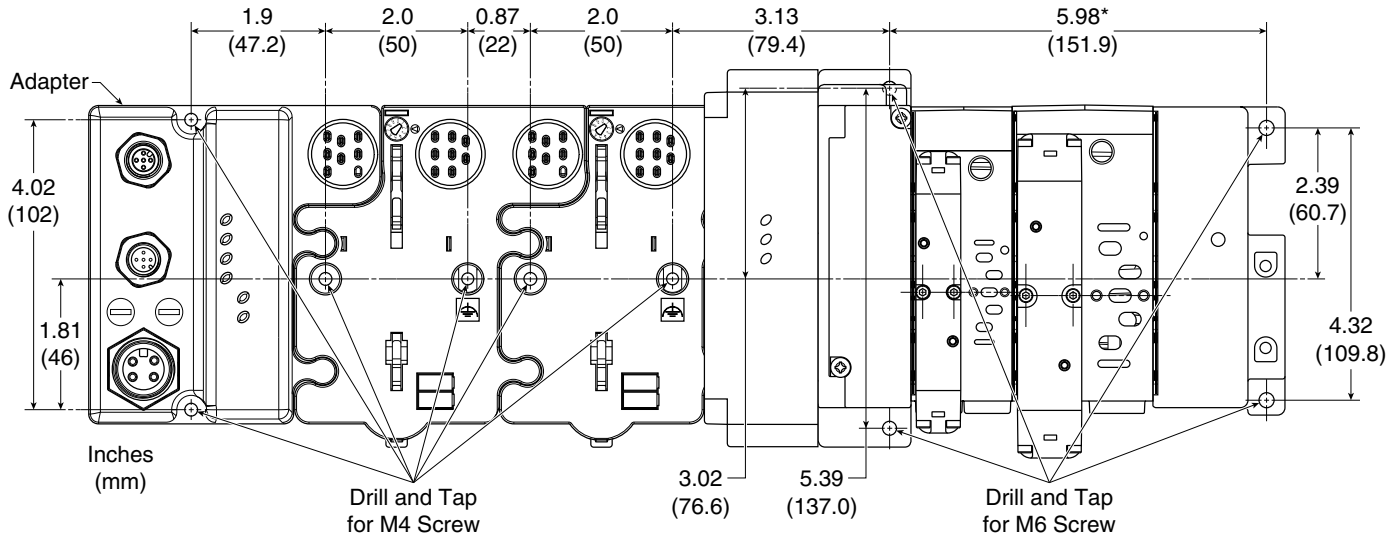
Mount the I/O Base

To mount the I/O base on a wall or panel, use the screw holes provided in the base.

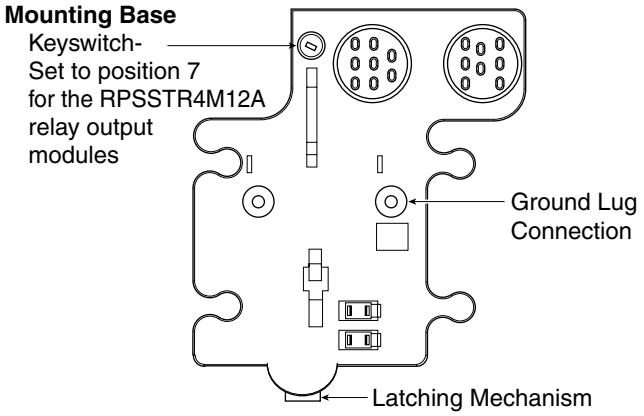
A mounting illustration for the base with an adapter is shown below.



*Depending on the type and number of manifolds, this dimension may vary. Consult Ross for specific information.

Install the Mounting Base as Follows:

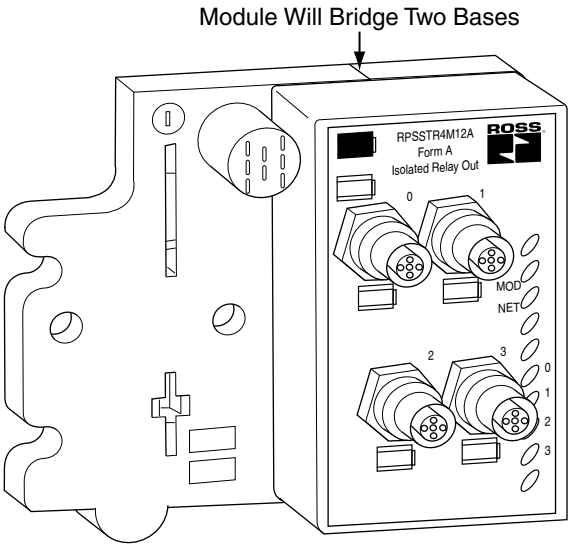
1. Lay out the required points as shown above in the drilling dimension drawing.
2. Drill the necessary holes for #8 (M4) machine or self-tapping screws.
3. Mount the base using #8 (M4) screws.
4. Ground the system using the ground lug connection. (The ground lug connection is also a mounting hole.)



Install the Relay Output Module

To Install the Relay Output Module, Proceed as Follows:

1. Using a bladed screwdriver, rotate the keyswitch on the mounting base clockwise until the number 7 aligns with the notch in the base.
2. Position the module vertically above the mounting base. The module will bridge two bases.



3. Push the module down until it engages the latching mechanism. You will hear a clicking sound when the module is properly engaged.

The locking mechanism will lock the module to the base.

Remove the Relay Output Module From the Mounting Base

To Remove the Module from the Mounting Base:

1. Put a flat blade screwdriver into the slot of the orange latching mechanism.
2. Push the screwdriver toward the I/O module to disengage the latch. The module will lift up off the base.
3. Pull the module off of the base.

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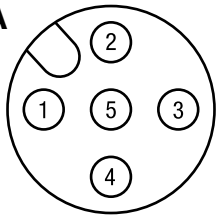
Wire the Relay Output Module

Following are wiring instructions for the relay output module.

RPSSTR4M12A



(view into connector)

Pin 1 - 24VDC

Pin 2 - Output 0B (M12-A)
Output 1B (M12-B)
Output 2B (M12-C)
Output 3B (M12-D)

Pin 3 - Common

Pin 4 - Output 0A (M12-A)
Output 1A (M12-B)
Output 2A (M12-C)
Output 3A (M12-D)

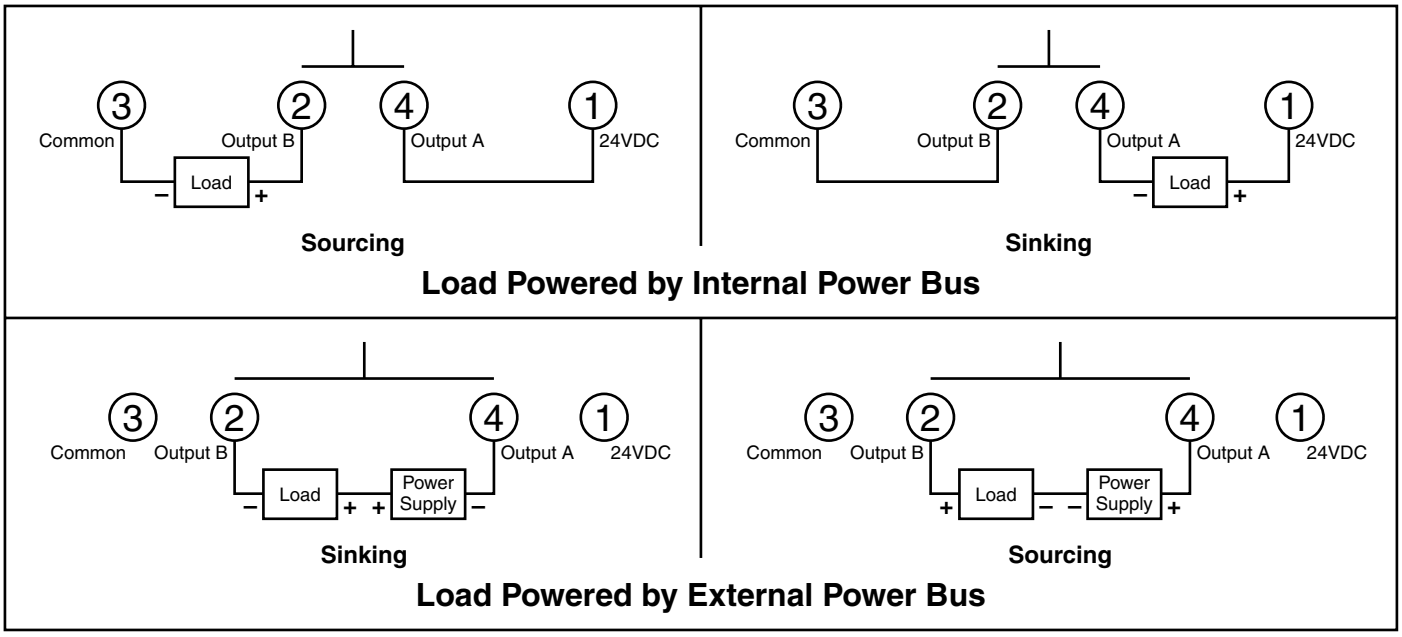
Pin 5 - No Connect

ATTENTION

Make sure all connectors and caps are securely tightened to properly seal the connections against leaks and maintain IP67 requirements.

WARNING

RPSSTR4M12A is rated for 5-28.8 VDC only. Do not connect it to an AC power source.



Communicate With Your Module

I/O messages are sent to (consumed) and received from (produced) the I/O module. These messages are mapped into the processor's memory. The I/O relay output module consumes 1 byte of output data (scanner Tx - status). It does not produce data (scanner Rx).

Default Data Map for the Relay Output Modules

RPSSTR4M12A

Message Size: 1 Byte

	7	6	5	4	3	2	1	0	
Consumes (Scanner Tx)	Not Used				Ch3	Ch2	Ch1	Ch0	Output State

Where: 0 = OFF, 1 = ON

EDS File Requirements

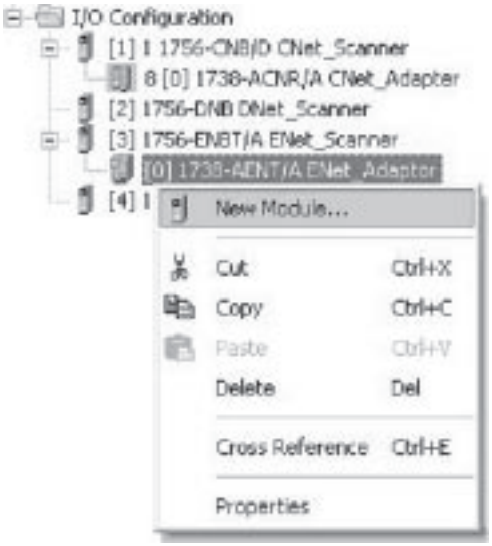
The EDS file is available online at www.rosscontrols.com/rosslit.htm.

Add Relay Output Module to RSLogix 5000 I/O Configuration

To add your relay output module to RSLogix 5000 I/O configuration, follow these steps:

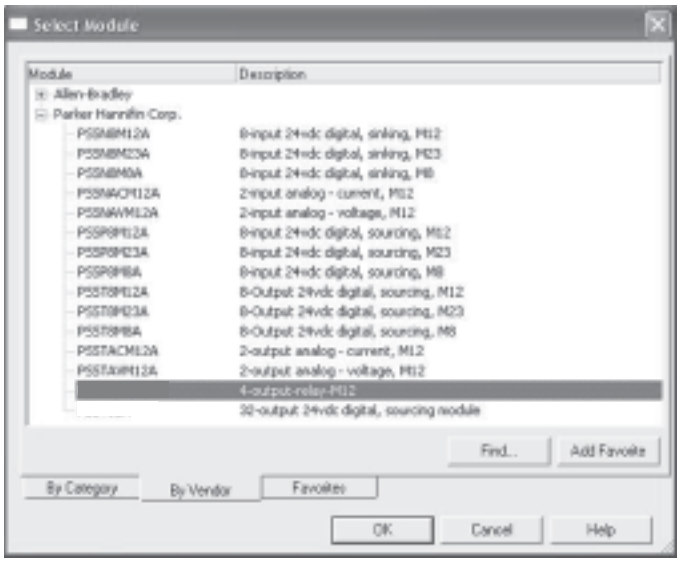
- In RSLogix 5000:
  - For ControlNet, highlight the ***RPSSCCNA or 1738-ACNR (Shown)***, right click and select ***New Module***.

  - For EtherNet/IP, highlight the ***RPSSCENA*** or ***1738-AENT (Shown)***, right click and select ***New Module***.

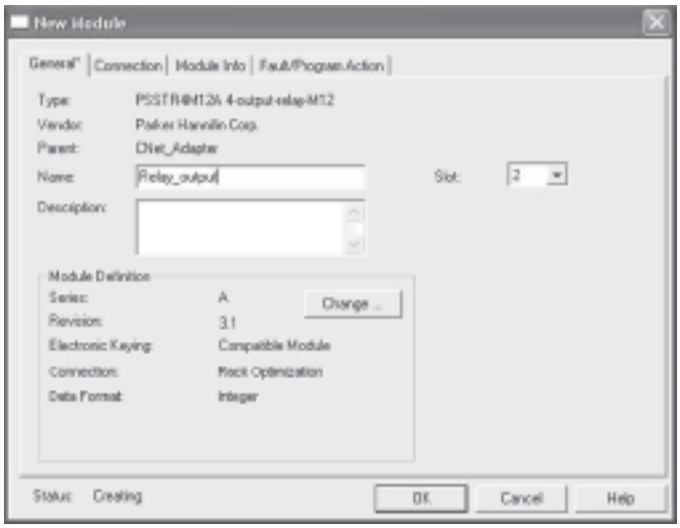


If your RSLogic 5000 is Version 15.X or greater:

- Choose the ***RPSSTR4M12A*** module from the list of Parker modules.



- Enter a name and click OK.



- Notice that the RPSSTR4M12A is now under the I/O configuration.

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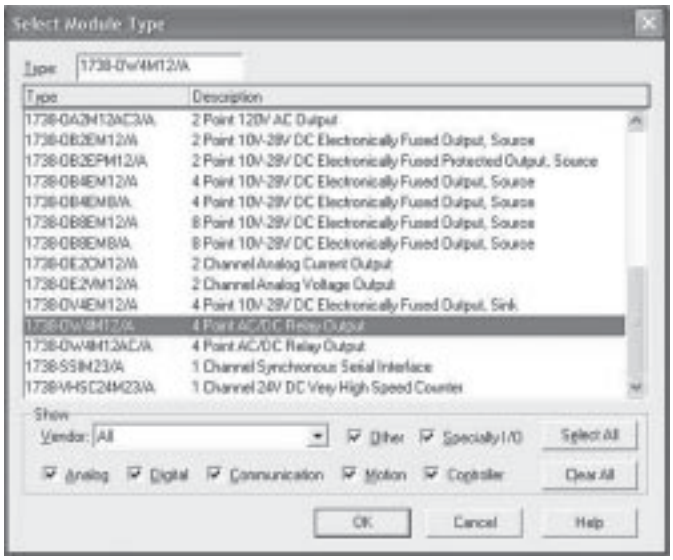
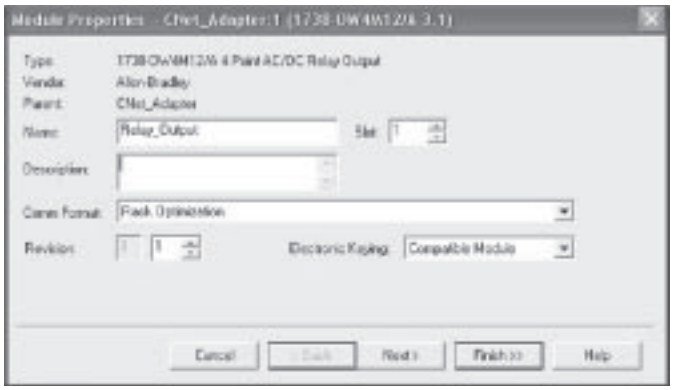
If your RSLogic 5000 is Version 13.X:

- Choose the equivalent Rockwell Automation module 1738-OW4M12/A.



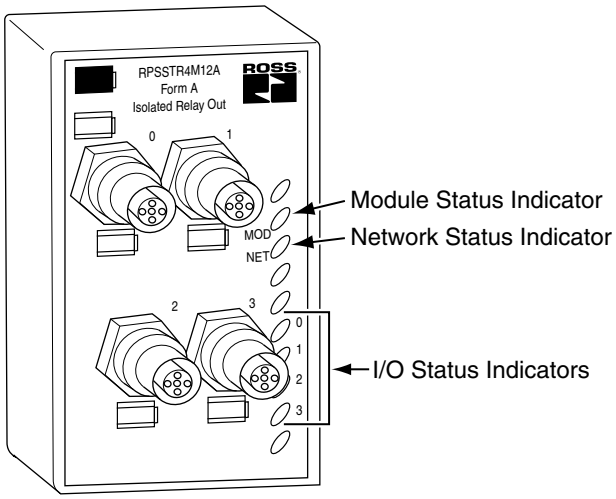
- Enter a name (optional), slot number, and comm. format. Make sure to choose ***Compatible Module for Electronic Keying*** setting.



- Choose ***Next*** to set **RPI.**
- Choose ***Finish***. Notice that the output module is now under the I/O configuration

Troubleshoot With the Indicators

RPSSTR4M12A



Indication	Probable Cause
Module Status	
Off	No power applied to device
Green	Device operating normally
Flashing Green	Device needs commissioning due to missing, incomplete, or incorrect configuration
Flashing Red	Recoverable fault
Red	Unrecoverable fault - may require device replacement
Flashing Red/Green	Device is in self-test

Indication	Probable Cause
Network Status	
Off	Device is not on line: - Device has not completed dup_MAC-id test. - Device not powered - check module status indicator.
Flashing Green	Device is on line but has no connections in the established state.
Green	Device is on line and has connections in the established state.
Flashing Red	One or more I/O connections in timed-out state.
Red	Critical link failure - failed communication device. Device detected error that prevents it from communicating on the network.
Flashing Red/Green	Communication faulted device - the device has detected a network access error and is in communication faulted state. Device has received and accepted an Identity Communication Faulted Request - long protocol message.

Indication	Probable Cause
I/O Status	
Off	Output is inactive
Yellow	Output is active and under control

Specifications - Following are specifications for the RPSSTR4M12A relay output module.

Relay Output Modules	
Outputs per Module	4 Form A isolated (normally open) electromechanical relays
Output Voltage Range (load dependent)	5-28.8VDC @ 2.0A resistive
Output Current Rating (at rated power)	**Resistive:** 2A @ 5-28.8VDC **Inductive:** 2.0A steady state @ 5-28.8VDC, L/R = 7 ms
Output Signal Delay OFF to ON, Maximum[1]	10 ms (time from valid output on signal to relay energization by module)
Output Delay Time, ON to OFF, Maximum[1]	26 ms (time from valid output off signal to relay deenergization by module)
Off-State Leakage Current (Max. at 240VAC)	1.2 mA and bleed resistor through snubber circuit
Power Rating (steady state)	60W max. for 28.8VDC resistive output 60VA max. for 28.8VDC inductive output
Initial Contact Resistance	30 mW
Switching Frequency, Maximum	1 operation/3s (0.3 Hz at rated load)
Operate/Release Time, Maximum	10 ms
Bounce Time	1.2 ms (mean)
Minimum Contact Load	100µA at 100 mVDC
Expected Life of Electrical Contacts	Minimum 100,000 operations @ rated loads
Fusing	Module outputs are not fused. If fusing is desired, you must supply external fusing.
Keyswitch Position	7
LED Indicators	4 yellow output status, logic side 1 green/red network status, logic side 1 green/red module status, logic side
PointBus Current, Maximum	90 mA @ 5VDC
Power Dissipation, Maximum	0.5W @ 28.8VDC
Thermal Dissipation, Maximum	1.7 BTU/hr. @ 28.8VDC
Isolation Voltage Between any 2 sets of contacts Customer load to logic	 Tested to withstand 2550VDC for 60s Tested to withstand 2550VDC for 60s
Field Power Bus Supply Voltage Voltage Range, Maximum Supply Current	 None required 5-28.8VDC 2A per channel maximum, 8A per module
Dimensions Inches (Metric)	1.25H x 2.63W x 4.25D (31.75H x 66.80W x 107.95D)
Operating Temperature	IEC 60068-2-1 (Test Ad, Operating Cold), IEC 60068-2-2 (Test Bd, Operating Dry Heat), IEC 60068-2-14 (Test Nb, Operating Thermal Shock): -20 to 60°C (-4 to 140°F)
Storage Temperature	IEC 60068-2-1 (Test Ab, Un-packaged Non-operating Cold), IEC 60068-2-2 (Test Bb, Un-packaged Non-operating Dry Heat), -40 to 85°C (-40 to 185°F)
Relative Humidity	IEC 60068-2-30 (Test Db, Un-packaged Non-operating Damp Heat): 5 to 95% non-condensing
Shock	IEC60068-2-27 (Test Ea, Unpackaged Shock): Operating 15g, Non-operating 50g
Vibration	IEC60068-2-6 (Test Fc, Operating): 2g @ 10 to 500Hz
ESD Immunity	IEC 61000-4-2: 6kV contact discharges, 8kV air discharges
Radiated RF Immunity	IEC 61000-4-3: 10V/m with 1kHz sine-wave 80%AM from 80MHz to 2000MHz 10V/m with 200Hz 50% Pulse 100%AM at 900Mhz 10V/m with 200Hz 50% Pulse 100%AM at 1890Mhz
EFT/B Immunity	IEC 61000-4-4: ±3kV at 5kHz on signal ports
Surge Transient Immunity	IEC 61000-4-5: ±1kV line-line(DM) and ±2kV line-earth(CM) on signal ports
Conducted RF Immunity	IEC 61000-4-6: 10Vrms with 1kHz sine-wave 80%AM from 150kHz to 80MHz
Emissions	CSPR 11: Group 1, Class A
Enclosure Type Rating	Meets IP65/66/67 (when marked)
Mounting Base Screw Torque	#8 screw, 7.5 in. lbs. in Aluminum, 16 in. lbs. in Steel
Wiring Category[2]	1 - on signal ports
Weight Imperial (Metric)	0.637 lb. (0.289 kg)
Certifications: (when product is marked)	c-UL-us UL Listed Industrial Control Equipment, certified for US and Canada CE European Union 89/336/EEC EMC Directive, compliant with: EN 61000-6-4; Industrial Emissions EN 50082-2; Industrial Immunity EN 61326; Meas./Control/Lab., Industrial Requirements EN 61000-6-2; Industrial Immunity European Union 73/23/EEC LVD Directive, compliant with: EN61131-2; Programmable Controllers C- Tick Australian Radiocommunications Act, compliant with: AS/NZS CISPR 11; Industrial Emissions

1. OFF to ON or ON to OFF delay is time from a valid output “on” or “off” signal to output energization or de-energization.
2. Use this Conductor Category information for planning conductor routing. Refer to Publication A10324 “Industrial Automation Wiring and Grounding Guidelines”.

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ROSS®

Installation & Service Instructions
A10325

Safety Guidelines for the Application, Installation, and Maintenance of Solid State Controls

ISSUED: August, 2007
Supersedes: None

⚠ WARNING

To avoid unpredictable system behavior that can cause personal injury and property damage:

- **Disconnect electrical supply (when necessary) before installation, servicing, or conversion.**
- **Disconnect air supply and depressurize all air lines connected to this product before installation, servicing, or conversion.**
- **Operate within the manufacturer's specified pressure, temperature, and other conditions listed in these instructions.**
- **Medium must be moisture-free if ambient temperature is below freezing.**
- **Service according to procedures listed in these instructions.**
- **Installation, service, and conversion of these products must be performed by knowledgeable personnel who understand how pneumatic products are to be applied.**
- **After installation, servicing, or conversion, air and electrical supplies (when necessary) should be connected and the product tested for proper function and leakage. If audible leakage is present, or the product does not operate properly, do not put into use.**
- **Warnings and specifications on the product should not be covered by paint, etc. If masking is not possible, contact your local representative for replacement labels.**

Safety Guide

For more complete information on recommended application guidelines, see the Installation Safety Guidelines section of Bulletin 600 (Form A10309) or you can download the Installation Safety Guidelines at: www.rosscontrols.com/rosslit.htm.

⚠ WARNING

FAILURE OR IMPROPER SELECTION OR IMPROPER USE OF THE PRODUCTS AND/OR SYSTEMS DESCRIBED HEREIN OR RELATED ITEMS CAN CAUSE DEATH, PERSONAL INJURY AND PROPERTY DAMAGE.

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The products described herein, including without limitation, product features, specifications, designs, availability and pricing, are subject to change by ROSS CONTROLS and its subsidiaries at any time without notice.

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Foreword

This ROSS CONTROLS® publication is formatted to harmonize with NEMA Standards Publication No. ICS 1.1-1984 (R1988, R1993, R1998, R2003) Industrial Control and Systems: Safety Guidelines for the Application, Installation, and Maintenance of Solid State Controls. The text of the NEMA Standard has been reprinted verbatim, with NEMA's permission, in the left column, captioned "NEMA Standard Text". The right column, captioned "Explanatory Information", contains additional comments. The comments provide supplementary information to the NEMA Standard to help the reader better understand the characteristics of industrial equipment employing solid state technology.

NEMA Standards Publication ICS 1.1-1984 (R1988, R1993, R1998, R2003) is available from the National Electrical Manufacturers Association, 1300 North 17th Street, Suite 1752, Rosslyn, VA 22209. It may be purchased or a copy downloaded at no charge at www.nema.org/stds/ics1-1.cfm.

NEMA Standard Text

SCOPE – This Standards Publication is intended to provide general guidelines for the application, installation, and maintenance of solid state control in the form of individual devices or packaged assemblies incorporating solid state components. The emphasis of the guidelines is personnel safety. Applicable NEMA standards and product related instructions should be carefully followed.

Explanatory Information

(Supplementary Comments – Not part of NEMA STANDARDS PUBLICATION NO. ICS-1.1)

SCOPE

The scope of this ROSS CONTROLS Publication (A10325) is identical to the scope of NEMA Standards Publication No. ICS 1.1, quoted in the left column.

Section 1
Definitions

Electrical Noise – Unwanted electrical energy that has the possibility of producing undesirable effects in the control, its circuits and system. Electrical noise includes Electromagnetic Interference (EMI) and Radio Frequency Interference (RFI).

Electrical Noise Immunity – The extent to which the control is protected from a stated electrical noise.

Electromagnetic Interference (EMI) – Electromagnetic disturbance that manifests itself in performance degradation, malfunction, or failure of electronic equipment. (IEC)

Off-State Current – The current that flows in a solid state device in the off-state condition.

Off-State Condition – The conditions of a solid state device when no control signal is applied.

On-State Condition – The condition of a solid state device when conducting.

Radio Frequency Interference (RFI) – RFI is used interchangeably with EMI. EMI is a later definition that includes the entire electromagnetic spectrum, whereas RFI is more restricted to the radio-frequency band, generally considered to be between 10k and 10G Hz. (IEC)

Surge Current – A current exceeding the steady state current for a short time duration, normally described by its peak amplitude and time duration.

Transient Overvoltage – The peak voltage in excess of steady state voltage for a short time during the transient conditions (e.g., resulting from the operations of a switching device).

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Section 2

General

(Sections 2 through 5 are classified as Authorized Engineering Information 11-15-1984.)

Solid State and electro-mechanical controls can perform similar control functions, but there are certain unique characteristics of solid state controls which must be understood.

In the application, installation and maintenance of solid state control, special consideration should be given to the characteristics described in 2.1 through 2.7.

General Comments

Solid state devices provide many advantages such as high speed, small size, and the ability to handle extremely complex functions. However, they differ from electromechanical devices in the basic operating characteristics and sensitivity to environmental influences. In addition, solid state devices exhibit different failure mechanisms when overstressed.

The comments which follow are intended to provide additional information to help the reader better understand the operating characteristics, environmental limitations, and failure modes of industrial equipment that incorporates solid state technology. Those who select, install, use, and service such equipment should apply that knowledge to make appropriate decisions that will optimize the performance and safety of their applications.

2.1 Ambient Temperature

Care should be taken not to exceed the ambient temperature range specified by the manufacturer.

C.2.1 Ambient Temperature

Temperature of the air immediately surrounding an open solid state device is the ambient temperature which must be considered. When equipment is installed in an enclosure, the enclosure internal air temperature is the ambient temperature which must be considered. Solid state component manufacturers usually publish the component failure rate for an ambient temperature of 40 degrees Celsius. A useful rule of thumb is: The failure rate of solid state components doubles for every ten degrees Celsius rise in temperature. This rule of exponential increases in failure rate is a strong incentive for the user to keep the ambient temperature as low as possible.

Also see sections 3.6.1, and 3.6.2.

2.2 Electrical Noise

Performance of solid state controls can be affected by electrical noise. In general, complete systems are designed with a degree of noise immunity. Noise immunity can be determined through tests such as described in 3.4.2. Manufacturer recommended installation practices for reducing the effect of noise should be followed.

C.2.2 Electrical Noise

Solid state devices are generally more susceptible to electrical noise interference than their electromechanical counterparts. The reasons are straightforward. The operating mechanism for electromechanical devices requires a deliberate input of electrical energy that can be converted into a sustained mechanical force that is strong enough to close the hard contacts and maintain the closure for the duration on the ON cycle. Most random electrical noise signals lack the energy content to produce that magnitude of mechanical force.

The operating mechanism for solid state devices is totally different. The deliberate electric energy input is used to disturb the placement of the electrically charged particles within the molecular structure. This molecular displacement changes the electrical characteristic from that of an insulator to that of a conductor or vice versa.

The required energy level is very low. In addition, a sustained signal is not required for components such as SCRs, triacs, and logic gates because these types are self-latching. Most random electrical noise signals are of the momentary low energy type. Since it is difficult to separate deliberate signals from random noise, the devices are thereby more susceptible. This is cause for special concern regarding the electrical environment and possible need for noise rejection measures.

Also see sections 3.4, 3.4.1, 3.4.2, 3.4.3.

2.3 Off-State Current

Solid state controls generally exhibit a small amount of current flow when in the off-state condition. Precautions must be exercised to ensure proper circuit performance and personnel safety. The value of this current is available from the manufacturer.

C.2.3 Off-State Current

Off-state current is also referred to as leakage current in the literature. A solid state "contact" is a solid block of material which is switched from ON to OFF by a change internally from a conductor to an insulator. Since a perfect insulator does not exist, there is always some leakage current present as long as voltage is applied to the device. The presence of leakage current indicates that OFF does not mean OPEN. The reader is warned that simply turning a solid state device OFF does not remove the possibility of a shock hazard.

Solid state *and* electromechanical devices, used as inputs to solid state controls, must be compatible with the solid state equipment with which they are used. Solid state devices have inherent off-state current, as explained in the preceding paragraph. Electromechanical devices may also permit a small amount of current to flow when the device is in the "open" position due to poor insulation characteristics, which may be subject to further deterioration with age and use. An example is a switching device that employs a carbon brush in contact with an insulating segment of the switch in the off-state, such that a conductive film may be deposited by the brush on the insulating segment. Any input device that could produce an erroneous signal of sufficient magnitude to cause a malfunction of the solid state equipment, such as unintended turn ON or inability to turn OFF, should not be used with solid state controls.

Also see section 3.5.2.

2.4 Polarity

Incorrect polarity of applied voltages may damage solid state controls. The correct polarity of solid state controls should be observed.

C.2.4 Polarity

In some instances incorrect polarity can cause damage to controlled equipment or unintended actuation of outputs. This could result in personal injury due to an unexpected response of the controlled equipment or process.

Also see section 3.3.2.

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2.5 Rate of Rise-Voltage or Current (DV/DT or DI/DT)

Solid state controls can be affected by rapid changes of voltage or current if the rate of rise (DV/DT and/or DI/DT) is greater than the maximum permissible value specified by the manufacturer.

C.2.5 Rate of Rise-Voltage or Current (DV/DT or DI/DT)

The DV/DT rating specifies the maximum rate at which voltage may be applied to the power terminals of a solid state device. Voltage applied at a rate exceeding the DV/DT rating can switch the device ON without an input signal being applied. Electrical noise with high frequency content is one source of rapidly changing voltage.

Another common source of high DV/DT is an inductive load that is switched off faster than the stored energy can be dissipated. This fast switching produces “inductive kick voltages” that might exceed the DV/DT limit.

The DI/DT rating specifies the maximum rate at which current flow may be increased when switching from OFF to ON. Currents that increase faster than the DI/DT rating cause localized hot spots due to current crowding in a small area until the entire cross section can become conductive. This results in gradual degradation of the device. Subsequent operations generally result in over dissipation and short circuit failures even under normal load conditions. The most common situations for high DI/DT are low load impedance, or capacitance loads.

Manufacturers of solid state equipment usually include internal means to limit the rate of rise of voltage and current. Nonetheless, the user should be aware that additional external means may be necessary to adjust to the specific conditions of some installations.

2.6 Surge Current

Current of a value greater than that specified by the manufacturer can affect the solid state control. Current limiting means may be required.

C.2.6 Surge Current

The manufacturer may specify allowable surge current. Common practice is to specify the peak sinusoidal current that can be allowed for one-half cycle at line frequency. The intent behind this practice is to give the user information for selecting an appropriate fuse or other current limiting means.

Applications that require short term overcurrent capability (e.g., motor starting) must observe the manufacturer's restrictions on the number of times the device can be subjected to overcurrent in a specified time interval. The user should be aware that this specification may vary depending upon whether the conditions call for hot starts or cold starts. Hot start means that the solid state component is at or near the normal operating temperature due to previous operation history when the overcurrent condition occurs. Cold start means that the solid state component is at or below 40 degrees Celsius when the overcurrent condition occurs.

2.7 Transient Overvoltage

Solid state controls may be affected by transient overvoltages which are in excess of those specified by the manufacturer. Voltage limiting means should be considered and may be required.

C.2.7 Transient Overvoltage

Solid state devices are especially sensitive to excessive voltage. When the peak voltage rating is exceeded, even for a fraction of a second, permanent damage can occur. The crystalline structure of the device may be irretrievably altered and the device may no longer be able to turn OFF. The external symptom of this situation is exactly the same as that of an electromechanical device with welded contacts.

Minimum Holding Current

Another characteristic of concern is the minimum holding current requirement for triacs and SCRs. When the load current falls below the minimum value, typically 25 – 100 mA, the triac or SCR ceases conduction and passes only off-state current until again triggered. Thus, it may not be possible for the circuit to turn-on or conduct full load current for very light loads. In these instances, a load resistor called a bleeder resistor may be connected to the output to provide the minimum load. In some equipment special circuitry is provided to overcome this problem.

Section 3
Application Guidelines

3.1 General Application Precautions

3.1.1 Circuit Considerations

The consequences of some malfunctions such as those caused by shorted output devices, alteration, loss of memory, or failure of isolation within components or logic devices, require that the user be concerned with the safety of personnel and the protection of the electronics.

It is recommended that circuits which the user considers to be critical to personnel safety, such as “end of travel” circuits and “emergency stop” circuits, should directly control their appropriate functions through an electromechanical device independent of the solid state logic. Such circuits should initiate the stop function through deenergization rather than energization of the control device. This provides a means of circuit control that is independent of system failure.

C.3.1.1 Circuit Considerations

The predominant failure mode of solid state devices is in the ON condition. This failure mode and the other types of failures mentioned in the NEMA Standard are the reasons for the precautions that are recommended for safety-critical circuits on systems that control potentially hazardous processes or machine operations.

Alternatively, if solid-state is used for circuits designated as safety-critical, the circuits should be designed to provide safety equivalent to the recommended “hard-wired” electromechanical circuits. In such cases consideration should be given to techniques such as: redundancy, feedback loops, diagnostics, interlocking and read-only memory for critical parts of a program.

De-energization rather than energization of the control device should be specified for STOP circuits so broken wires or corroded contacts do not go undetected. E-stop push buttons or pull cords should be installed at appropriate locations on a machine to provide operators with a rapid and convenient means for removing power from devices which control machine motion.

Alternate methods of stopping such as dynamic braking and regenerative braking may be available. In order to accomplish the dynamic braking and regenerative braking function, the control circuit, or part of it, in the equipment must remain energized during the stopping mode. However, operator interface components such as stop push buttons or pull cords, must still be connected through normally closed contacts so broken wires or corroded contacts do not go undetected. Also, if dynamic or regenerative braking is used for emergency stopping, provision should be made to interrupt the power circuit as soon as the machine comes to a stop.

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3.1.2 Power Up/Power Down Considerations

Consideration should be given to system design so that unsafe operation does not occur under these conditions since solid state outputs may operate erratically for a short period of time after applying or removing power.

C.3.1.2 Power Up/Power Down Considerations

Response of a system during power up/power down can create hazards not encountered during normal operation. Erratic operation of solid state outputs due to the changing voltage of DC power supplies during start up is one example. To avoid unpredictable outputs, many power supplies incorporate a power turn-on time delay circuit. This allows power supply output voltage to reach its specified value before being applied to solid state logic and output circuits. If this protection is not part of the DC supplies for a system, a timing circuit external to the power supply can be added to delay the application of power to output devices.

Removing all power or losing all power from a system simultaneously usually does not result in a hazard since the power for machine operation is also being removed. However, when power other than electrical power is being controlled, a power interlock circuit may be required to protect against unexpected machine motion. Power interlocks with automatic shutdown should be included if erratic or hazardous operation results due to loss of one power supply in a system with multiple supplies. Automatic power supply sequencing should be employed in systems that require the application or removal of power in a specific sequence. If the STOP or E-STOP sequence normally employs dynamic braking, alternative safeguards, such as automatic mechanical braking upon loss of power, should be provided if coasting stops are hazardous.

If hazardous operation can result from unexpected restoration of power during a power outage or a system shutdown, the system should include a feature which requires a deliberate operator action before power is reapplied to the system.

3.1.3 Redundancy and Monitoring

When solid state devices are being used to control operations, which the user determines to be critical, it is strongly recommended that redundancy and some form of checking be included in the system. Monitoring circuits should check that actual machine or process operation is identical to controller commands; and in the event of failure in the machine, process, or the monitoring system, the monitoring circuits should initiate a safe shutdown sequence.

C.3.1.3 Redundancy and Monitoring

The normal operating mechanism for solid state components depends upon a deliberate electrical signal input altering the internal molecular structure of the semiconductor material. Unfortunately, spurious input signals may also alter the internal molecular structure without any means for external detection that this has happened. Therefore, solid state devices are subject to malfunction due to random causes that are undetectable. Because of this, redundancy and monitoring are the most highly recommended means for counteracting this situation.

When redundancy is used, dissimilar components not susceptible to common cause failure should be used for the redundant elements if a common cause could produce simultaneous failure of those elements in a dangerous mode.

A “safe shutdown sequence” can involve much more than disconnecting electrical power for some machinery and processes. Examples include machines with high inertia and hazardous access points; processes that become unstable at shutdown unless a specific sequence is followed; etc. The control system for such applications should be configured to deal with the particular hazard(s) through use of special features such as automatic transfer of control functions to redundant devices in the event of failure of primary controls; alarm circuits and diagnostics to signal and identify failures that require repair in order to maintain redundancy; emergency power sources with automatic transfer upon loss of primary power source; or other appropriate features.

3.1.4 Overcurrent Protection

To protect triacs and transistors from shorted loads, a closely matched short circuit protective device (SCPD) is often incorporated. These SCPDs should be replaced only with devices recommended by the manufacturer.

C.3.1.4 Overcurrent Protection

Even a closely matched short circuit protective device (SCPD) will generally protect a solid state device only against shorted loads, an accidental short to ground or a phase to phase short. Depending upon the application, additional protective measures may be needed to protect the solid state devices against small to moderate overcurrents. Consult with the manufacturer if necessary.

3.1.5 Overvoltage Protection

To protect triacs, SCRs and transistors from overvoltages, it may be advisable to consider incorporating peak voltage clamping devices such as varistors, zener diodes, or snubber networks in circuits incorporating these devices.

C.3.1.5 Overvoltage Protection

See section 2.7.

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3.2 Circuit Isolation Requirements

3.2.1 Separating Voltages

Solid state logic uses low level voltage (e.g., less than 32 volts DC) circuits. In contrast, the inputs and outputs are often high level (e.g., 120 volts AC) voltages. Proper design of the interface protects against an unwanted interaction between the low level and high level circuits; such an interaction can result in a failure of the low voltage circuitry. This is potentially dangerous. An input and output circuitry incorporating effective isolation techniques (which may include limiting impedance or Class 2 supplied circuitry) should be selected.

3.2.2 Isolation Techniques

The most important function of isolation components is to separate high level circuits from low level circuits in order to protect against the transfer of a fault from one level to the other.

Isolation transformers, pulse transformers, reed relays, or optical couplers are typical means to transmit low level logic signals to power devices in the high level circuit. Isolation impedance means also are used to transmit logic signals to power devices.

C.3.2.1 Separating Voltages

For specifications of Class 2 circuitry, refer to Article 725 of the National Electrical Code, NFPA 70.

C.3.2.2 Isolation Techniques

In addition to utilizing the various components discussed in the left column, specific wiring techniques should be applied to assure separation of power circuit wires from logic circuit wires. If at all possible, logic wires should be run in a conduit that is segregated for that purpose only. Multiple conductors in a shielded cable is an appropriate substitute for separate conduits. Another common practice is to run the logic signals through twisted pairs of wire. Regardless of the circumstances, wires carrying logic signals should never be wrapped in the same bundle with wires that carry power signals.

3.3 Special Application Considerations

3.3.1 Converting Ladder Diagrams

Converting a ladder diagram originally designed for electromechanical systems to one using solid state control must account for the differences between electromechanical and solid state devices. Simply replacing each contact in the ladder diagram with a corresponding solid state “contact” will not always produce the desired logic functions or fault detection and response. For example, in electromechanical systems, a relay having a mechanically linked normally open (NO) and normally closed (NC) contact can be wired to check itself. Solid state components do not have a mutually exclusive NO-NC arrangement. However, external circuitry can be employed to sample the input and “contact” state and compare to determine if the system is functioning properly.

C.3.3.1 Converting Ladder Diagrams

The example cited in this section of the NEMA Standard illustrates only one of a number of reasons for special care in converting an electromechanical (relay) ladder diagram to a programmable controller (PC) program. Some other basic considerations are:

- A PC program is an instruction to the PC's central processing unit to enable it to perform the logic functions and sequences for a particular application. Typically, the PC's logic level components are electrically isolated from the actual input, sensor and actuator devices, as contrasted with electromechanical controls which usually include contacts and coils of the actual plant floor devices in the control schematic. Therefore a PC program normally functions as open-loop control, unless feedback loops from the plant floor devices to separate inputs of the PC are provided and programmed to cause corrective action if inconsistencies are detected. Programmers of PC systems should evaluate functional and safety implications of all control paths and provide appropriate feedback arrangements as needed.

(continued)

C.3.3.1 (continued)

- In an electromechanical implementation of a ladder diagram, power is available to every rung at all times, so that the logic of the various rungs is executed continually and simultaneously, limited of course by the operating delays inherent in the electromechanical devices. By contrast, a typical PC examines the status of input devices (I/O scan), then executes the user program in sequence (program scan), then changes outputs accordingly in the next I/O scan. Therefore, the sequential order of a PC program can be of more importance and significance than in its electromechanical counterpart, particularly when special instructions such as “immediate” inputs or outputs are programmed as some PCs permit. Also, differences in response characteristics of components, differences in system architecture, and the scan time associates with a PC system can combine to change timing characteristics of a circuit significantly. In particular, care must be taken in handling momentary or rapidly changing inputs to a PC system which might be missed between scans. Simple transfer of a ladder diagram without consideration of these characteristics of PCs may produce unintended and possibly hazardous results. Programmers should consult the user’s manual in order to understand the characteristics of the particular PC being used, and provide appropriate features in the program to accommodate them.
- Another concern is the operating mode of devices connected to input terminals. Input signals must be arranged so loss of signal due to a broken wire or corroded contact does not go undetected and create a hazardous condition. In particular, stop functions should be initiated by opening a normally closed external circuit rather than closing a normally open circuit even though the system is capable of being programmed to accept either type of input.

The considerations described in this section apply to the creation of “new” programs as well as conversion of existing ladder diagrams.

3.3.2 Polarity and Phase Sequence

Input power and control signals should be applied with polarity and phase sequence as specified by the manufacturer. Solid state devices can be damaged by the application of reverse polarity or incorrect phase sequence.

C.3.3.2 Polarity and Phase Sequence

Additionally, incorrect polarity or phase sequence connection may cause erratic response by solid state controls, with potential hazards to personnel. Frequently, such a system contains a detection circuit that illuminates an indicator when incorrect phase sequence is applied. Phase sequence may be corrected by interchanging any two system input power leads. It is advisable to check rotation of motors whenever input power leads are disconnected and reconnected in a system.

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3.4 Planning Electrical Noise Rejection

The low energy levels of solid state controls may cause them to be vulnerable to electrical noise. This should be considered in the planning stages.

3.4.1 Assessing Electrical Environment

Sources of noise are those pieces of equipment that have large, fast changing voltages or currents when they are energized or de-energized, such as motor starters, welding equipment, SCR type, adjustable speed devices and other inductive devices. These devices, as well as the more common control relays and their associated wiring, all have the capability of inducing serious current and voltage transients on their respective power lines. It is these transients which nearby solid state controls must withstand and for which noise immunity should be provided.

An examination of the proposed installation site of the solid state control should identify equipment that could contaminate power lines. All power lines that will be tapped by the proposed solid state control should be examined for the presence, severity, and frequency of noise occurrences. If found, system plans should provide for the control of such noise.

3.4.2 Selecting Devices to Provide Noise Immunity

Installation planning is not complete without examination of the noise immunity characteristics of the system devices under consideration. Results of tests to determine relative immunity to electrical noise may be requested from the manufacturer. Two such standardized tests are the ANSI (C37.90a-1974) Surge Withstand Capability Test and the NEMA (ICS.1-1983) noise test referred to as The Showering Arc Test. These are applied where direct connection of solid state control to other electromechanical control circuits is intended. Circuits involving analog regulating systems or high speed logic are generally more sensitive to electrical noise; therefore, isolation and separation of these circuits is more critical.

Further information on electrical noise and evaluation of the severity of noise may be found in ANSI/IEEE Publication No. 518-1982.

Where severe power line transients are anticipated or noted, appropriate filters such as commercially available line filter, isolation transformers, or voltage limiting varistors, should be considered.

All inductive components associated with the system should be examined for the need for noise suppression.

C.3.4.1 Assessing Electrical Environment

Noise can also occur in the form of electromagnetic radiation, or due to improper grounding practices. Section C.3.4.3 explains these forms of noise and precautionary measures that should be taken for protection against them.

In many instances a system may begin to malfunction some time after it has been installed and is working properly. This may be due to recent installation of new equipment capable of inducing noise into presently operating systems. Thus, it is not sufficient to merely evaluate a system at the time of installation. Periodic rechecks should be made, especially as other equipment is moved, modified, or newly installed. When installing a solid state system, it is wise to assume various noise sources exist and install the system to guard against possible interference.

C.3.4.2 Selecting Devices to Provide Noise Immunity

Inductive devices are capable of generating high voltage transients when switched off. In addition to possibly causing damage to solid state devices by exceeding the semiconductor voltage rating, the high voltage transient can be coupled to other portions of a system where it appears as noise. Fortunately, it is fairly easy to limit the effects of this type of noise with some form of suppression device. When necessary, in addition to suppression devices often provided in solid state equipment, an external suppressor should be connected as close as possible to the source of the transient for maximum attenuation.

NOTE: A surge suppressor increases drop-out time of an electromechanical device.

3.4.3 Design of Wiring for Maximum Protection

Once the installation site and power conductors have been examined, the system wiring plans that will provide noise suppression should be considered.

Conducted noise enters solid state control at the points where the control is connected to input lines, output lines, and power supply wires.

Input circuits are the circuits most vulnerable to noise. Noise may be introduced capacitatively through wire to wire proximity, or magnetically from nearby lines carrying large currents. In most installations, signal lines and power lines should be separate. Further, signal lines should be appropriately routed and shielded according to manufacturer's recommendations.

When planning system layout, care must be given to appropriate grounding practice. Because design differences may call for different grounding, the control manufacturer's recommendations should be followed.

C.3.4.3 Design of Wiring for Maximum Protection

Noise can also occur in the form of electromagnetic radiation. Examples include radio frequency (RF) energy emanating from portable transceivers (walkie-talkie) and fixed station transmitters of various types. Close coupling is not required; the various lines entering the system act as receiving antennas. Tests described in 3.4.2 may not be sufficient to demonstrate noise immunity to radio frequency signals. Variations in building construction and equipment installation make it impossible for equipment manufacturers to perform meaningful tests of radio frequency sources. RF fields are affected by concentrating masses of metal such as steel beams, piping, conduit, metal enclosures, and equipment used in production such as fork lift trucks and products being transported on conveyors.

If the installation site will be subjected to this type of noise, thorough testing should be performed to assure that the solid state system has sufficient noise immunity for the expected levels of radio frequency energy. Corrective measures should be taken if necessary. These include shielding of solid state circuits and/or connected wiring and the establishment of restrictions to provide safe operating distances between the solid state equipment and the RF sources.

Grounding practices in industry are frequently misunderstood and often ignored. Poor grounding can lead to many problems in solid state systems. Intentionally grounding one circuit conductor of any electrical supply system is widely accepted and is generally required by electrical codes.

However, the non-current carrying parts of a system which enclose equipment and conductors must also be grounded. In addition to complying with various codes and standards, proper equipment grounding achieves several desirable objectives:

1. It reduces the potential difference between conductive surfaces to minimize electric shock hazard exposure for personnel.
2. It provides a path for passage of fault current to operate protective devices in the supply circuit.
3. It attenuates the electrical noise and transients which can reach enclosed equipment and also reduces the electrical noise which the equipment can contribute to its surroundings.

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3.5 Countering the Effects of Off-State Current

3.5.1 Off-State Current

Solid state components, such as triacs, transistors, and thyristors, inherently have in the off-state a small current flow called “off-state current”.

Off-state current may also be contributed by devices used to protect these components, such as RC snubbers.

C.3.5.1 Off-State Current

See section 2.3.

3.5.2 Off-State Current Precautions

Off-state currents in a device in the off-state may present a hazard of electrical shock and the device should be disconnected from the power source before working on the circuit or load.

Precautions should be taken to prevent the off-state current of an output device which is in the off-state from energizing an input device.

C.3.5.2 Off-State Current Precautions

The off-state current of a power switching device such as a solid state motor controller can be lethal. Simply switching off power via a stop push button in a control circuit is not a sufficient precaution, since off-state current will continue to flow through solid state devices which remain connected to the supply. Good practice requires disconnection of all power from equipment before working on or near exposed circuit parts. (See NFPA 70E, Part II.)

It should not be assumed that a shock hazard does not exist simply because a solid state circuit operates at low voltage levels. Standing on a wet floor or working in a damp location can lower a person’s body impedance to the extent that offstate current from low voltage also presents an electrical shock hazard.

If it is necessary to work on energized equipment, the guidelines detailed in section 5.2 for Preventive Maintenance should be followed. In addition to the specific procedures for personnel safety, care is needed when making measurements in energized systems. First, there is a possibility of damage to delicate instruments due to off-state current. Second, the off-state current can lead to false conclusions when using sensitive instruments to check for “contact continuity.”

When a device (solid state or electromechanical) that can produce a leakage current in the off-state is used to provide the input to a solid state control, the precautions explained in section C.2.3 apply.

3.6 Avoiding Adverse Environmental Conditions

3.6.1 Temperature

Solid state devices should only be operated within the temperature ranges specified by the manufacturer. Because such devices generate heat, care should be taken to see that the ambient temperature at the device does not exceed the temperature range specified by the manufacturer.

The main source of heat in a solid state system is the energy dissipated in the power devices. Since the life of the equipment can be increased by reducing operating temperature, it is important to observe the manufacturer's "maximum/minimum ambient temperature" guidelines, where ambient refers to the temperature of the air providing the cooling. The solid state equipment must be allowed to stabilize to within the manufacturer's recommended operating temperature range before energizing control functions.

When evaluating a system design, other sources of heat in the enclosure which might raise the ambient temperature should not be overlooked. For example, power supplies, transformers, radiated heat, sunlight, furnaces, incandescent lamps, and so forth should be evaluated.

In instances where a system will have to exist in a very hot ambient environment, special cooling methods may have to be employed. Techniques that are employed include cooling fans (with adequate filtering), vortex coolers, heat exchanges, and air conditioned rooms.

Over-temperature sensors are recommended for systems where special cooling is employed. Use of air conditioning should include means for prevention of condensing moisture.

C.3.6.1 Temperature

Operation above the maximum rated temperature will usually result in many failures in a short time. Nuisance type malfunctions can also be encountered as a result of elevated ambient temperature. These malfunctions, when they occur, are usually temporary and normal operation resumes when temperatures are lowered.

Some solid state devices temporarily cease to function when ambient temperature is below their minimum rated operating temperature. Operation in cold environments should be avoided or heaters should be installed in the equipment enclosures to bring the system up to the minimum specified operating temperature before applying power to the system.

Air circulating in a non-ventilated enclosure with equipment operating will be at a higher temperature than the room in which it is installed. A temperature differential of 10 to 20 degrees Celsius can be expected in a typical industrial installation.

Also see section 2.1.

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3.6.2 Contaminants

Moisture, corrosive gases and liquids, and conductive dust can all have adverse effects on a system that is not adequately protected against atmospheric contaminants.

If these contaminants are allowed to collect on printed circuit boards, bridging between the conductors may result in malfunction of the circuit. This could lead to noisy, erratic control operation, or at worst, a permanent malfunction. A thick coating of dust could also prevent adequate cooling on the board or heat sink, causing malfunction. A dust coating on heat sinks reduces their thermal efficiency.

Preventive measures include a specially conditioned room or a properly specified enclosure for the system.

C.3.6.2 Contaminants

Modules for solid state systems usually consist of electronic devices mounted on printed circuit boards with relatively close spacing between conductors. Moisture in the form of humidity is one of the atmospheric contaminants which can cause failure. If moisture is allowed to condense on a printed circuit board, the board metallizations could “electroplate” across the conductor spacings when voltage is applied. In low impedance circuits, this conductive path would immediately burn open, then reform to be burned open again. This action can lead to erratic operation. In high impedance circuits, a short circuit may appear resulting in a permanent malfunction. Specifications for equipment often include a relative humidity exposure limit, but appropriate precautions should be taken to prevent condensation. Failures due to moisture are often accelerated in the presence of corrosive gases or vapors. These increase the conductivity of the moisture layer allowing electromigration to occur more rapidly and at lower potentials.

3.6.3 Shock and Vibration

Excessive shock or vibration may cause damage to solid state equipment. Special mounting provisions may be required to minimize damage.

C.3.6.3 Shock and Vibration

Solid state systems usually have good resistance to shock and vibration since they contain no moving parts. However, at relatively high levels of shock or vibration, circuit boards may disengage from mating connectors if not restrained sufficiently. Circuit boards can crack, components can come out of sockets or component leads can break loose from a solder connection to the board. Mounting position is usually of little significance to solid state devices except in instances where air flow is required

3.7 The Need for Education – Knowledge Leads to Safety

Planning for an effective solid state circuit requires enough knowledge to make basic decisions that will render the system safe as well as effective.

Everyone who works with a solid state control should be educated in its capabilities and limitations. This includes in-plant installers, operators, service personnel, and system designers.

Section 4
Installation Guidelines

4.1 Installation and Wiring Practice

4.1.1

Proper installation and field wiring practices are of prime importance to the application of solid state controls. Proper wiring practice will minimize the influence of electrical noise, which may cause malfunction of equipment.

User and installers should familiarize themselves with the follow installation and wiring instructions in addition to requirements of all applicable codes, laws, and standards. The manufacturer of the device or component in question should be consulted whenever conditions arise that are not covered by the manufacturer's instructions.

4.1.2

Electrical noise is a very important consideration in any installation of solid state control. While wiring practices may vary from situation to situation, the following are basic to minimizing electrical noise:

1. Sufficient physical separation should be maintained between electrical noise sources and sensitive equipment to assure that the noise will not cause malfunctioning or unintended actuation of the control.
2. Physical separation should be maintained between sensitive signal wires and electrical power and control conductors. This separation can be accomplished by conduits, wiring trays, or as otherwise recommended by the manufacturer.
3. Twisted-pair wiring should be used in critical signal circuits and noise producing circuits to minimize magnetic interference.
4. Shielded wire should be used to reduce the magnitude of the noise coupled into the low level circuit by electrostatic or magnetic coupling.
5. Provisions of the 1984 National Electrical Code① with respect to grounding should be followed. Additional grounding precautions may be required to minimize electrical noise. These precautions generally deal with ground loop currents arising from multiple ground paths. The manufacturer's recommendations should be followed.

① Available from National Fire Protection Association, Batterymarch Park, Quincy, MA 02269

C.4.1.2

A great deal of effort goes into the design of solid state equipment to achieve a reasonable degree of noise immunity. Filters, shielding, and circuit design are all used. It is, however, impossible to design equipment which is impervious to every form of noise found in the industrial setting.

When installing a system using solid state technology it is wise to assume that electrical noise exists and install the equipment in accordance with the recommended guidelines to minimize problems.

Also see section 3.4.1.

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4.2 Enclosures (Cooling and Ventilating)

Suitable enclosures and control of the maximum operating temperature, both of which are environmental variables, may be needed to prevent malfunctions of solid state control.

The manufacturer's recommendations should be followed for the selection of enclosures, ventilation, air filtering (if required), and ambient temperature. These recommendations may vary from installation to installation, even within the same facility.

C.4.2 Enclosures (Cooling and Ventilating)

NEMA Standards Publication No. 250-1985, Rev. 2, May 1988, classifies enclosures by type number and specifies their design test requirements.

Also see section 2.1 and 3.6.1.

4.3 Special Handling of Electrostatic Sensitive Devices

Some devises may be damaged by electrostatic charges. These devices are identified and should be handled in the special manner specified by the manufacturer.

NOTE: Plastic wrapping material used to ship these devices may be conductive and should not be used as insulating material.

C.4.3 Special Handling of Electrostatic Sensitive Devices

Many problems due to electrostatic discharge (ESD) occur due to handling of modules during installation or maintenance.

In addition to specific guidelines provided by an equipment supplier, the following general guidelines can help reduce damage due to ESD.

1. Use a grounding bracelet if possible to minimize charge build-up on personnel.
2. Handle a module by the edges without touching components or printed circuit paths.
3. Store modules with ESD sensitive components in the conductive packaging used for shipping the modules. Also, use conductive packaging when returning static sensitive modules for repair.

4.4 Compatibility of Devices with Applied Voltages and Frequencies

Prior to energization, users and installers should verify that the applied voltage and frequency agree with the rated voltage and frequency specified by the manufacturer.

NOTE: Incorrect voltage or frequency may cause a malfunction of, or damage to, the control.

4.5 Testing Precautions

When testing solid state control, the procedures and recommendations set forth by the manufacturer should be followed.

When applicable, instrumentation and test equipment should be electrically equivalent to that recommended by the manufacturer for the test procedure. A low impedance voltage tester should not be used.

High voltage insulation tests and dielectric tests should never be used to test solid state devices. If high voltage insulation of field wiring is required, solid state devices should be disconnected. Ohmmeters should only be used when and as recommended by the equipment manufacturer.

Testing equipment should be grounded; if it is not, special

C.4.5 Testing Precautions

Make-do test devices such as incandescent lamps or neon lamps should not be used for checking voltages in solid state systems. Incandescent lamps have low impedance; the low impedance of these devices can effectively change a voltage level from a logic "1" condition to a logic "0" condition when attempting to make a measurement. Unexpected machine motion can result if an output to a controlled device is energized as a result. Neon lamps do not respond to voltages typically used in logic circuits (e.g., 32 volts DC or less). Use of a neon lamp tester could lead to false conclusions about the voltage level present in a circuit.

High input impedance meters are required to obtain accurate voltage measurements in high impedance circuits. Unless otherwise specified by the manufacturer, a meter with an input impedance of ten megohms or greater is recommended for making voltage measurements. The meter must also have sufficient sensitivity to measure logic level voltages; some meters do not respond to low voltages.

4.6 Startup Procedures

Checks and tests prior to startup and startup procedures recommended by the manufacturer should be followed.

C.4.6 Startup Procedures

Startup procedures can provide important benefits for safety with new installation, or after modifications or repairs. A “dry run” under controlled conditions can verify proper installation and functioning of the control system before it is turned over to operating personnel.

Many programmable solid state systems have the capability for simulating operation in a mode known as “test” mode or “dry run” mode. These modes allow a user to check a program and correct obvious programming errors with outputs disabled. Unexpected machine motion and possible damage to workpieces and equipment is thus avoided. These modes can also be used to verify proper system operation after a repair.

Many programmable systems provide capability for “force on” and “force off” of inputs and outputs. Use of these functions can reduce troubleshooting and maintenance time by enabling personnel to bypass certain operations without physically operating switches on a machine. Care must be taken when using “force” functions to avoid exposing personnel to hazardous machine motions or process operations.

For controllers operating a machine tool or robot, running a part program at a fraction of the programmed operating speed with a workpiece of soft material is considered “good practice”. This allows an operator to observe possible interference of tooling with the part and make corrections to the program. A workpiece of soft material such as wood, plastic, or machinable wax will minimize risk of tool damage if there is a tool crash with the workpiece.

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Section 5
Preventive Maintenance and Repair Guidelines

5.1 General

A well-planned and executed maintenance program is essential to the satisfactory operation of solid state electrical equipment. The kind and frequency of the maintenance operation will vary with the kind and complexity of the equipment as well as with the nature of the operating conditions. Maintenance recommendations of the manufacturer or appropriate product standards should be followed.

Useful reference publications for setting up a maintenance program are NFPA 70B-1983, Maintenance of Electrical Equipment, and NFPA 70E-1983, Electrical Safety Requirements for Employee Workplaces.

5.2 Preventive Maintenance

The following factors should be considered when formulating a maintenance program:

1. Maintenance must be performed by qualified personnel familiar with the construction, operation, and hazards involved with the control.
2. Maintenance should be performed with the control out of operation and disconnected from all sources of power. If maintenance must be performed while the control is energized, the safety related practices of NFPA 70E should be followed.
3. Care should be taken when servicing electrostatic sensitive components. The manufacturer's recommendations for these components should be followed.
4. Ventilation passages should be kept open. If the equipment depends upon auxiliary cooling, e.g., air, water, or oil, periodic inspection (with filter replacement when necessary) should be made of these systems.
5. The means employed for grounding or insulating the equipment from ground should be checked to assure its integrity *(see 4.5)*.
6. Accumulations of dust and dirt on all parts, including on semiconductor heat sinks, should be removed according to the manufacturer's instructions, if provided; otherwise, the manufacturer should be consulted. Care must be taken to avoid damaging any delicate components and to avoid displacing dust, dirt, or debris in a way that permits it to enter or settle into parts of the control equipment.

(continued)

C.5.2 Preventive Maintenance

Lithium batteries are frequently used for memory backup in solid state equipment due to their excellent shelf life and high energy to weight ratio. Lithium is a highly reactive metal that can cause burns if there is contact with skin. The batteries are sealed so there is seldom a problem of contact with lithium as long as reasonable care is exercised when handling them. They should only be used in their intended application and not subjected to rough handling. When batteries are replaced in equipment, the batteries removed should be disposed of in accordance with supplier's instructions.

The Department of Transportation has certain regulations that prohibit shipment of equipment with batteries installed if the batteries contain 0.5 gram or greater of lithium. The batteries must be removed from equipment and shipped separately in a container approved by the Department of Transportation. Additional Department of Transportation restrictions apply to the shipment of lithium batteries.

NEMA Standards Publication No. ICS 1.3 – 1986, Preventive Maintenance of Industrial Control and System Equipment, is recommended for personnel responsible for maintenance of equipment.

5.2 Preventive Maintenance (continued)

7. Enclosures should be inspected for evidence of deterioration. Accumulated dust and dirt should be removed from the top of the enclosures before opening doors or removing covers.
8. Certain hazardous materials removed as part of maintenance or repair procedure (e.g., polychlorinated biphenyls (PCB) found in some liquid filled capacitors) must be disposed of as described in Federal regulations.

5.3 Repair

If equipment condition indicates repair or replacement, the manufacturer's instruction manual should be followed carefully. Diagnostic information within such a manual should be used to identify the probable source of the problem, and to formulate a repair plan. The level of field repair recommended by the manufacturer should be followed.

When solid state equipment is repaired, it is important that any replacement part be in accordance with the recommendations of the equipment manufacturer. Care should be taken to avoid the use of parts which are no longer compatible with other changes in the equipment. Also, replacement parts should be inspected for deterioration due to "shelf life" and for signs of rework or wear which may involve factors critical to safety.

After repair, proper start-up procedures should be followed. Special precautions should be taken to protect personnel from hazards during start-up.

5.4 Safety Recommendations for Maintenance Personnel

All maintenance work should be done by qualified personnel familiar with the construction, operation, and hazards involved with the equipment. The appropriate work practices of NFPA 70E should be followed.

C.5.3 Repair

Follow manufacturer's instructions exactly when replacing power semiconductors mounted on heatsinks since improper installation may become the source of further difficulties. Torque semiconductors or bolts retaining semiconductors to the value specified using a torque wrench. Too much pressure against a heatsink can damage a semiconductor while too little can restrict the amount of heat transferred from the semiconductor to the heatsink and result in operation at higher temperature with decreased reliability.

Exercise care when removing modules from a system during maintenance. Failed modules are frequently returned to the manufacturer for repair. Any physical damage sustained during removal may result in more expensive repair or render the module unrepairable if damage is too great.

Modules with electrostatic sensitive components should be handled by the edges without touching components or printed circuit conductors. Use packaging material supplied with the replacement module when shipping the module to the manufacturer for repair.

When the scope of repairs exceeds the manufacturer's recommendations for field repair, the module(s) should be returned to the manufacturer for repair. Doing so will help to ensure that only properly selected components are used, and that all necessary hardware and firmware revisions are incorporated into the repair. Failure to make necessary updates may result in safety, compatibility or performance problems which may not become apparent for some time after the repaired module has been placed back in service. When firmware is protected by copyright law, updates can be provided legally only by the manufacturer or licensee.

Also see section 4.3.

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Installation & Service Instructions
A10329

W66 Size 0 & W66 Size 00
Interposed Regulators

ISSUED: August, 2007
Supersedes: None

⚠ WARNING

To avoid unpredictable system behavior that can cause personal injury and property damage:

- **Disconnect electrical supply (when necessary) before installation, servicing, or conversion.**
- **Disconnect air supply and depressurize all air lines connected to this product before installation, servicing, or conversion.**
- **Operate within the manufacturer's specified pressure, temperature, and other conditions listed in these instructions.**
- **Medium must be moisture-free if ambient temperature is below freezing.**
- **Service according to procedures listed in these instructions.**
- **Installation, service, and conversion of these products must be performed by knowledgeable personnel who understand how pneumatic products are to be applied.**
- **After installation, servicing, or conversion, air and electrical supplies (when necessary) should be connected and the product tested for proper function and leakage. If audible leakage is present, or the product does not operate properly, do not put into use.**
- **Warnings and specifications on the product should not be covered by paint, etc. If masking is not possible, contact your local representative for replacement labels.**

Safety Guide

For more complete information on recommended application guidelines, see the Installation Safety Guidelines section of Bulletin 600 (Form A10309) or you can download the Installation Safety Guidelines at: www.rosscontrols.com/rosslit.htm.

⚠ WARNING

FAILURE OR IMPROPER SELECTION OR IMPROPER USE OF THE PRODUCTS AND/OR SYSTEMS DESCRIBED HEREIN OR RELATED ITEMS CAN CAUSE DEATH, PERSONAL INJURY AND PROPERTY DAMAGE.

This document and other information from ROSS CONTROLS, its subsidiaries and authorized distributors provide product and/or system options for further investigation by users having technical expertise. It is important that you analyze all aspects of your application, including consequences of any failure and review the information concerning the product or systems in the current product catalog. Due to the variety of operating conditions and applications for these products or systems, the user, through its own analysis and testing, is solely responsible for making the final selection of the products and systems and assuring that all performance, safety and warning requirements of the application are met.

The products described herein, including without limitation, product features, specifications, designs, availability and pricing, are subject to change by ROSS CONTROLS and its subsidiaries at any time without notice.

EXTRA COPIES OF THESE INSTRUCTIONS ARE AVAILABLE FOR INCLUSION IN EQUIPMENT / MAINTENANCE MANUALS THAT UTILIZE THESE PRODUCTS. CONTACT YOUR LOCAL REPRESENTATIVE.

Introduction

Follow these instructions when installing, operating, or servicing the product.

Installation & Operating Instructions:

An interposed regulator is used to provide regulated pressure to individual valves in a manifolded valve arrangement. Two basic modes of regulation are available as follows:

Single Interposed Regulation - Provides adjustable regulated air pressure to the valve inlet.

Dual Interposed Regulation - Provides (2) separately adjustable regulated air pressures, one to each of the valves exhaust passages. The valves exhaust (coming out of its inlet passage) is directed to manifold or subbase exhaust port "5".

⚠ **CAUTION: The reverse valve porting utilized with Dual Interposed Regulation will reverse the function of 4-Way, 3-Position cylinder to exhaust and 4-Way, 3-Position inlet to cylinder valves. Utilize the opposite function valve for normal operation.**

The interposed regulator should be installed with reasonable accessibility for service whenever possible. Repair service kits are available. Keep pipe or tubing lengths to a minimum with inside clean and free of dirt and chips. Pipe joint compound should be used sparingly and applied only to the male pipe, never into the female port. Do not use PTFE tape to seal pipe joints. Pieces have a tendency to break off and lodge inside the unit, possibly causing malfunction.

Air applied to the interposed regulator must be filtered to realize maximum component life.

Lubrication

Factory pre-lubed. If lubricating in service, use paraffin based mineral oil with 150 to 200 SSU viscosity @100°F.

⚠ **CAUTION: Do not use oils that are synthetic, reconstituted, have an alcohol content or a detergent additive.**

Application Limits

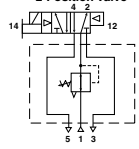
These products are intended for use in general purpose compressed air systems only.

Operating Pressure Range: Maximum 145 PSIG (1000 kPa)

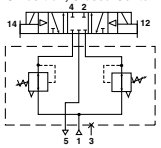
Ambient Temperature Range: -15°C to 49°C (5°F to 120°F)

ANSI Symbol

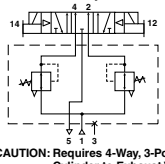
Common Port Regulator with 4-Way, 2-Position Valve



Independent Dual Port Regulator with 4-Way, 3-Position, Closed Center

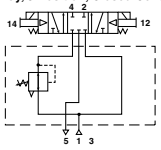


Independent Dual Port Regulator with 4-Way, 3-Position, Inlet to Cylinder Function



⚠ CAUTION: Requires 4-Way, 3-Position, Cylinder to Exhaust Valve

Independent Single Port Regulator with 4-Way, 3-Position, Closed Center



Installation:

(See Figure 1, Size 00 Interposed Regulator shown as example)

⚠ Warning:

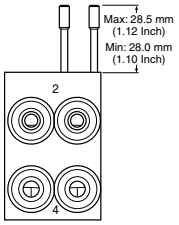
Not following these instruction may result in Interposed Regulator damage or inadequate thread engagement, which may lead to personal injury, property damage, or economic loss.

Important:

- **Remove pressure and electrical connections before installation.**
- **All threads on tie rods and screws must be free of rust, water or other debris, which could prevent finger thread engagement.**

W66 Size 0 & W66 Size 00 Interposed Regulators

Step 1: Install Tie Rods



1. Install two Tie Rods (6) to the base, torque finger tight.
2. Adjust tie rod height to 28.5/28.0 mm (1.12/1.10 inch) as figure shows.
3. If finger tight height exceeds 28.5 mm (1.12 inch), use mechanical tightening as necessary to get the proper height.

Note: "Base" could be a manifold, sub-base or interposed flow control.

Step 2: Install Interposed Regulator

1. Lay the Interposed Regulator Gasket (5) on the Base. Make sure the two rubber projections are face up and the orientation of the gasket is correct.
2. Engage both Tie Rods (6) into mounting holes on Regulator Body, lower the Regulator Body.
3. Carefully engage the Electrical Plug into the Base.
4. Continue to lower the Regulator Body by carefully engaging the two rubber projections on the gasket into the appropriate holes on the Regulator Body.
5. Press the Regulator Body by hand firmly. To confirm the gasket is indeed attached to the Regulator Body, lift the Regulator Body by about one half inch. Both rubber projections should remain in the holes.
6. Lay the Regulator Body back on the Base.

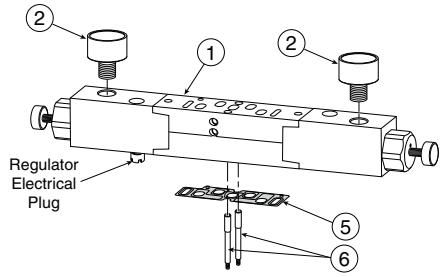
Step 3: Install Valve

1. Locate Valve Gasket (7) on bottom of Valve Body.
2. Install valve onto Regulator.
3. Carefully engage the Valve Electrical Plug.
4. Using hex wrench, tighten two Screws (8) – torque 1.5 to 1.7 Nm (13 to 15 in-lb) for Size 0, 0.9 to 1.1 Nm (8 to 10 in-lb) for Size 00.

Step 4: Leakage Check

1. Apply pressure to base and check for audible leakage at various joints. If any are present, do not not operate the valve, repeat the assembly procedure until satisfied.

Note: If both a Interposed Flow Control and Interposed Regulator is to be installed, the Flow Control should be installed between the Regulator and the Base. Refer to Interposed Flow Control Installation & Service Instructions (A10327) for Interposed Flow Control installation.



Size 0 Independent Port Interposed Regulator

Outlet Pressure Adjustment:

1. Before turning on the air supply, turn the adjusting knob counterclockwise until compression is released from the pressure control spring then turn on air supply. Proceed to adjust the desired downstream pressure by turning adjusting knob clockwise. This permits pressure to build up slowly in the downstream line.
2. To decrease regulated pressure setting, always reset from a pressure lower than the final setting required. For e xample, lowering the secondary pressure from 550 kPa (80 PSIG) to 410 kPa (60 PSIG) is best accomplished by dropping the secondary pressure to 345 kPa (50 PSIG), then adjusting upward to 410 kPa (60 PSIG).

Service Instructions:

1. Disconnect air supply and depressurize the unit.
2. Loosen nut on adjusting screw. Turn adjusting screw counterclockwise until all downstream air is exhausted.
3. For Size 00 Regulator, remove Regulator Cartridge from block and replace with a new unit. For Size 0 Regulator, remove Regulator from base and replace with a new unit per installation procedure.
4. Reapply pressure to unit and check for audible leakage at joints or out bleed holes. If any are present, do not operate the valve. Repeat assembly procedure until satisfied.
5. Adjust outlet pressure per *Outlet Pressure Adjustment* procedure.

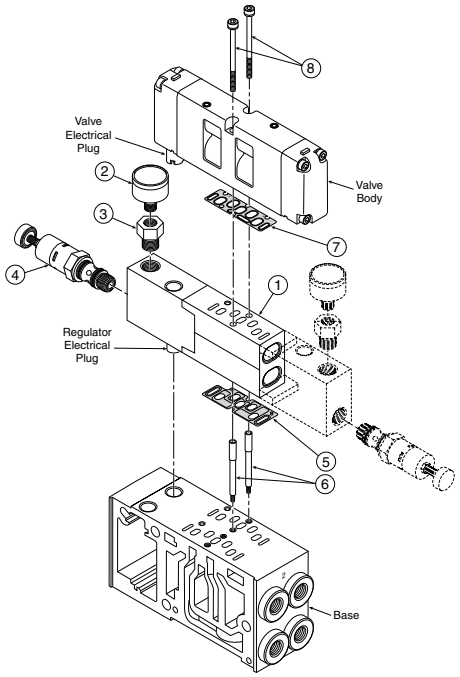


Figure 1
Size 00 Common Port Interposed Regulator
(Valve & Base shown for reference only)

Component List

The components listed below are for identification purposes only, some of these components are available in various Interposed Regulator Kits, some are not available due to special factory assembly. Individual components are not sold separately since all kit components should be installed when serviced.

Item	Description
1	Regulator Body Assembly
2	Gauge
3*	Adapter Fitting
4	Cartridge Regulator
5	Flow Control / Regulator Gasket
6	Tie Rods
7	Valve Gasket
8	Mounting Screws

* Alternating Fittings must be used in order to fit two Size 00 regulators to each other.

For all Instruction Sheets, go to www.rosscontrols.com

A10326 - W66 Size 0 (26mm) & W66 Size 00 (18mm) ISO 15407 Valve Service
A10327 - W66 Size 0 & W66 Size 00 ISO 15407-2 Interposed Flow Controls
A10329 - W66 Size 0 & W66 Size 00 Interposed Regulators
A10330 - W66 Size 0 & W66 Size 00 ISO 15407-1 Subbbase & Manifold Installation
A10331 - W65 Size 1, 2 & 3, ISO 5599-1, 5599-2 Subbase & Manifold Installation

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Form A10329

Installation & Service Instructions
A10324

Industrial Automation Wiring and Grounding Guidelines

ISSUED: August, 2007
Supersedes: None

⚠ WARNING

To avoid unpredictable system behavior that can cause personal injury and property damage:

- **Disconnect electrical supply (when necessary) before installation, servicing, or conversion.**
- **Disconnect air supply and depressurize all air lines connected to this product before installation, servicing, or conversion.**
- **Operate within the manufacturer's specified pressure, temperature, and other conditions listed in these instructions.**
- **Medium must be moisture-free if ambient temperature is below freezing.**
- **Service according to procedures listed in these instructions.**
- **Installation, service, and conversion of these products must be performed by knowledgeable personnel who understand how pneumatic products are to be applied.**
- **After installation, servicing, or conversion, air and electrical supplies (when necessary) should be connected and the product tested for proper function and leakage. If audible leakage is present, or the product does not operate properly, do not put into use.**
- **Warnings and specifications on the product should not be covered by paint, etc. If masking is not possible, contact your local representative for replacement labels.**

Safety Guide

For more complete information on recommended application guidelines, see the Installation Safety Guidelines section of Bulletin 600 (Form A10309) or you can download the Installation Safety Guidelines at: www.rosscontrols.com/rosslit.htm.

Purpose

This publication gives you general guidelines for installing an industrial automation system that may include programmable controllers, industrial computers, operator-interface terminals, display devices, and communication networks. **While these guidelines apply to the majority of installations, certain electrically harsh environments may require additional precautions.**

Use these guidelines as a tool for helping avoid potential electromagnetic interference (EMI) and transient EMI that could cause problems such as "adapter faults, rack faults, communication faults," etc. These guidelines are not intended to supersede local electrical codes.

This publication is organized into the following sections:

- Raceway Layout Considerations
- Mounting, Bonding, and Grounding
- Power Distribution
- Surge-Suppression
- Ferrite Beads
- Enclosure Lighting
- Avoiding Unintentional Momentary Turn-On of Outputs
- Related Publications

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Raceway Layout Considerations

The raceway layout of a system is reflective of where the different types of I/O modules are placed in I/O chassis. Therefore, you should determine I/O-module placement prior to any layout and routing of wires. However, when planning your I/O-module placement, segregate the modules based upon the conductor categories published for each I/O module so that you can follow these guidelines. Also, all conductors (AC or DC) in the same raceway must be insulated for the highest voltage applied to any one of the conductors in the raceway. These guidelines coincide with the guidelines for "the installation of electrical equipment to minimize electrical noise inputs to controllers from external sources" in IEEE standard 518-1982.

Categorize Conductors

Segregate all wires and cables into the following three categories (Table A). Refer to the publication for each specific I/O module or block for individual conductor-category classification of each I/O line.

Table A

Follow these Guidelines for Grouping Conductors with Respect to Noise

Group conductor cables fitting this description	Into this category:	Examples:
Control and AC Power — high-power conductors that are more tolerant of electrical noise than category 2 conductors and may also cause more noise to be picked up by adjacent conductors • Corresponds to IEEE levels 3 (low susceptibility) and 4 (power)	Category 1	• AC power lines for power supplies and I/O circuits. • High-power digital AC I/O lines — to connect AC I/O modules rated for high power and high noise immunity. • High-power digital DC I/O lines — to connect DC I/O modules rated for high power or with input circuits with long time-constant filters for high noise rejection. They typically connect devices such as hard-contact switches, relays, and solenoids.
Signal and Communication — low-power conductors that are less tolerant of electrical noise than category-1 conductors and should also cause less noise to be picked up by adjacent conductors (they connect to sensors and actuators relatively close to the I/O modules) • Corresponds to IEEE levels 1 (high susceptibility) and 2 (medium susceptibility)	Category 2	• Analog I/O lines and DC power lines for analog circuits. • Low-power digital AC/DC I/O lines — to connect to I/O modules that are rated for low power such as low-power contact-output modules. • Low-power digital DC I/O lines — to connect to DC I/O modules that are rated for low power and have input circuits with short time-constant filters to detect short pulses. They typically connect to devices such as proximity switches, photo-electric sensors, TTL devices, and encoders. • Communication cables (ControlNet, DeviceNet, RS-232-C cables) — to connect between processors or to I/O adapter modules, programming terminals, computers, or data terminals.
Intra-enclosure — interconnect the system components within an enclosure • Corresponds to IEEE levels 1 (high susceptibility) and 2 (medium susceptibility)	Category 3	• Low-voltage DC power cables — provide backplane power to the system components. • Communication cables — to connect between system components within the same enclosure.

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Route Conductors

To guard against coupling noise from one conductor to another, follow these general guidelines (Table B) when routing wires and cables (both inside and outside of an enclosure). Use the spacing given in these general guidelines with the following exceptions:

- Where connection points (for conductors of different categories) on a device are closer together than the specified spacing.
- Application-specific configurations for which the spacing is described in a publication for that specific application.

These guidelines are for noise immunity only. Follow all local codes for safety requirements.

Table B

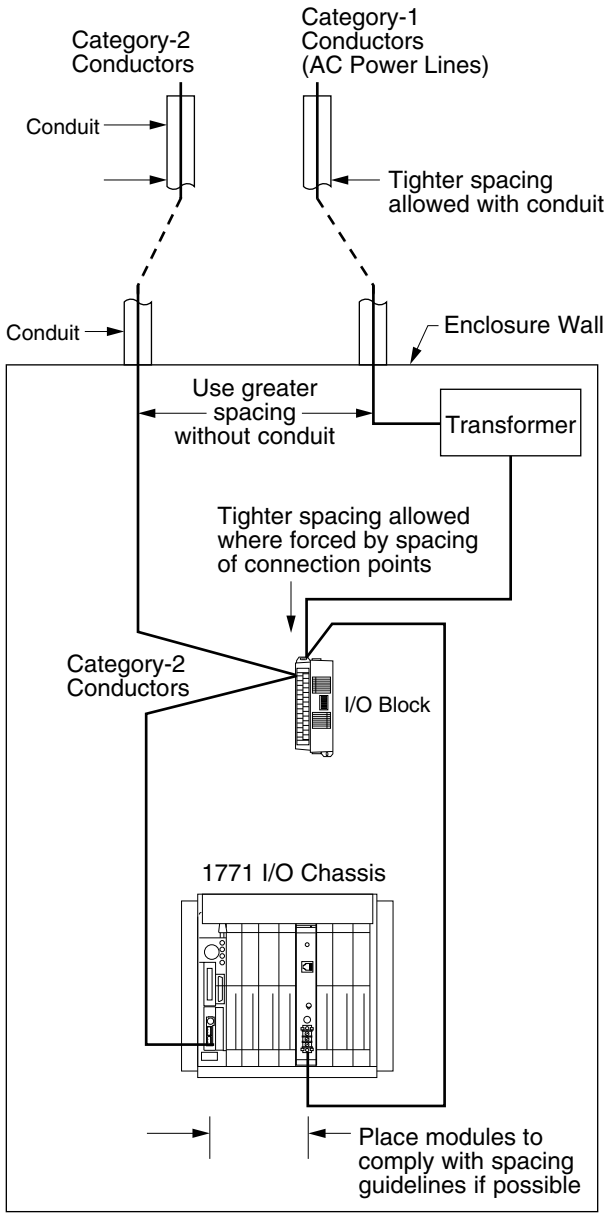
Follow these Guidelines for Routing Cables to Guard Against Noise

Route this category of conductor cables:	According to these guidelines:
Category 1	These conductors can be routed in the same cable tray or raceway with machine power conductors of up to 600VAC (feeding up to 100 hp devices).
Category 2	• If it must cross power feed lines, it should do so at right angles. • Route at least 5 ft from high-voltage enclosures, or sources of rf/microwave radiation. • If the conductor is in a metal wireway or conduit, each segment of that wireway or conduit must be bonded to each adjacent segment so that it has electrical continuity along its entire length, and must be bonded to the enclosure at the entry point. • Properly shield (where applicable) and route in a raceway separate from category-1 conductors. • If **in a contiguous metallic wireway or conduit**, route at least 0.08m (3 in) from category-1 conductors of less than 20A; 0.15m (6 in) from AC power lines of 20A or more, but only up to 100 kVA; 0.3m (1 ft) from AC power lines of greater than 100 kVA. • If **not in a contiguous metallic wireway or conduit**, route at least 0.15m (6 in) from category-1 conductors of less than 20A; 0.3m (1 ft) from AC power lines of 20A or more, but only up to 100 kVA; 0.6m (2 ft) from AC power lines of greater than 100 kVA.
Category 3	Route conductors external to all raceways in the enclosure or in a raceway separate from any category-1 conductors with the same spacing listed for category-2 conductors, where possible.

Important: These guidelines assume that you follow the Surge-Suppression guidelines (page 15). While these guidelines apply to the majority of installations, certain electrically harsh environments may require additional precautions.

The use of the guidelines in Table B are illustrated in Figure 1.

Figure 1 – Mounting Assembly Details



Mounting, Bonding, and Grounding

After establishing all layouts, you can begin mounting, bonding, and grounding each chassis. Bonding is the connecting together of metal parts of chassis, assemblies, frames, shields, and enclosures to reduce the effects of EMI and ground noise. Grounding is the connection to the grounding-electrode system to place equipment at earth ground potential.

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Mounting and Bonding the Chassis

You can mount the chassis with either bolts or welded studs. Figure 2 shows details for:

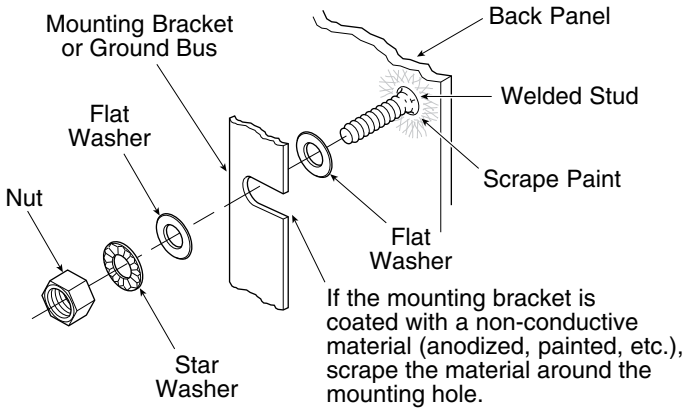
- Stud-mounting a ground bus or chassis to the back panel of the enclosure.
- Stud-mounting a back panel to the enclosure.
- Bolt-mounting a ground bus or chassis to the back panel of the enclosure.

If the mounting brackets of a chassis do not lay flat before the nuts are tightened, use additional washers as shims so that the chassis does not bend when you tighten the nuts.

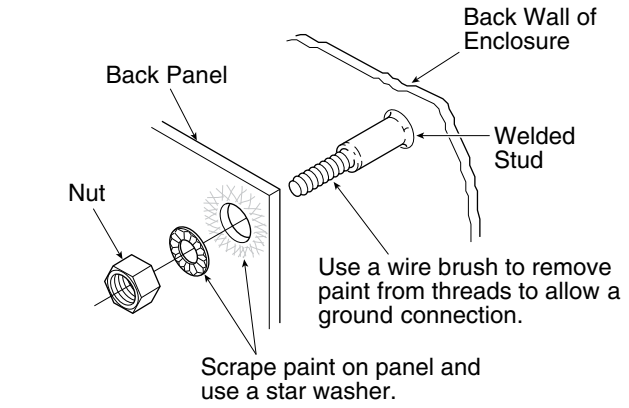
IMPORTANT

Do not bend the chassis. Bending the chassis might damage the backplane and result in poor connections.

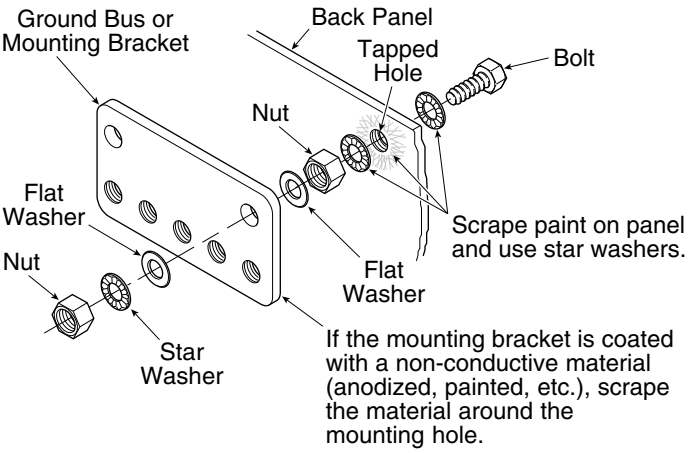
Figure 2 – Mounting Assembly Details


Mounting Bracket or Ground Bus
Back Panel
Welded Stud
Flat Washer
Scrape Paint
Nut
Flat Washer
If the mounting bracket is coated with a non-conductive material (anodized, painted, etc.), scrape the material around the mounting hole.
Star Washer

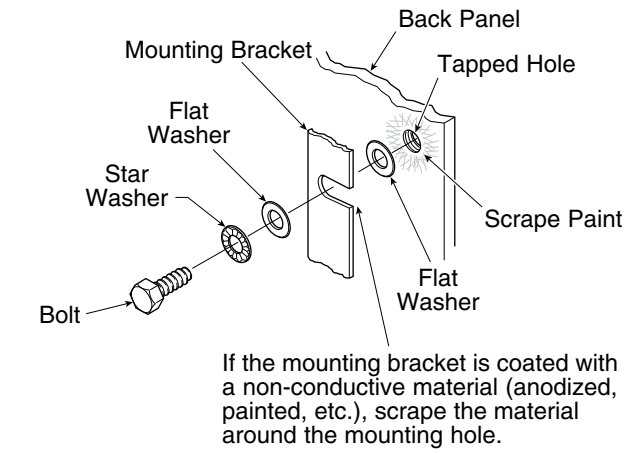
Stud Mounting of a Ground Bus or Chassis to the Back Panel


Back Wall of Enclosure
Back Panel
Welded Stud
Nut
Use a wire brush to remove paint from threads to allow a ground connection.
Scrape paint on panel and use a star washer.

Stud Mounting of the Back Panel to the Enclosure Back Wall


Ground Bus or Mounting Bracket
Back Panel
Tapped Hole
Bolt
Nut
Flat Washer
Scrape paint on panel and use star washers.
Nut
Flat Washer
If the mounting bracket is coated with a non-conductive material (anodized, painted, etc.), scrape the material around the mounting hole.
Star Washer

Bolt Mounting of a Ground Bus or Chassis to the Back Panel



Alternative Bolt Mounting of Chassis to the Back Panel

Make good electrical connection between each chassis, back-panel, and enclosure through each mounting bolt or stud. Wherever contact is made, remove paint or other non-conductive finish from around studs or tapped holes.

Bonding and Grounding the Chassis

With solid-state controls, proper bonding and grounding helps reduce the effects of EMI and ground noise. Also, since bonding and grounding are important for safety in electrical installations, local codes and ordinances dictate which bonding and grounding methods are permissible.

For example, for U.S. installations, the National Electrical Code (NEC) gives you the requirements for safe bonding and grounding, such as information about the size and types of conductors and methods of safely grounding electrical components.

Equipment-Grounding Conductor — In addition to making good connections through each bolt or stud, use either 1-inch copper braid or 8 AWG minimum stranded copper wire to connect each chassis, enclosure and central ground bus mounted on the back-panel. Figure 3 shows ground-bus connection details.

Figure 3 – Ground Bus Connection Details

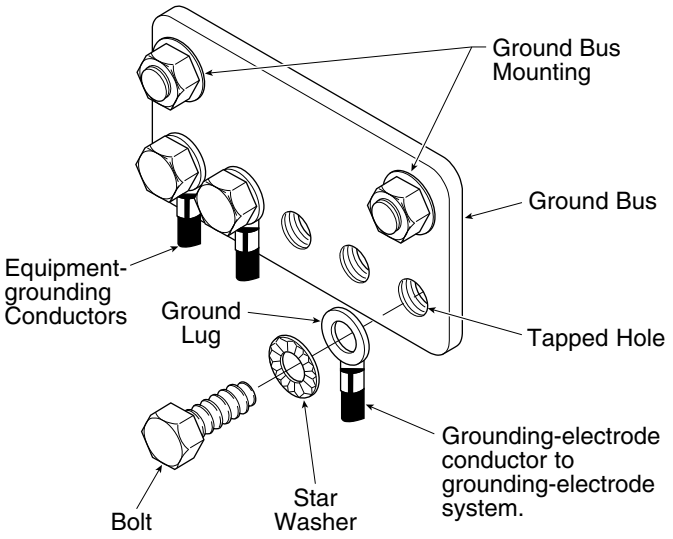
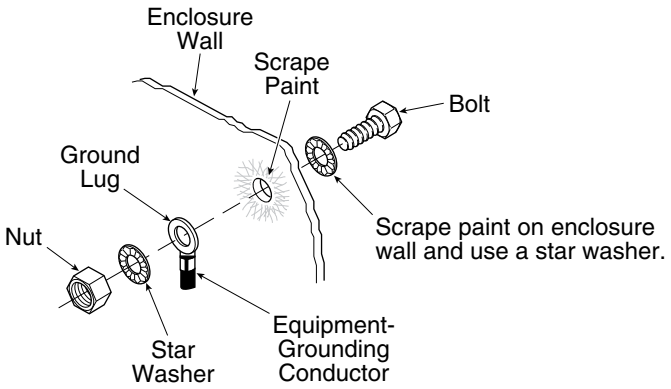


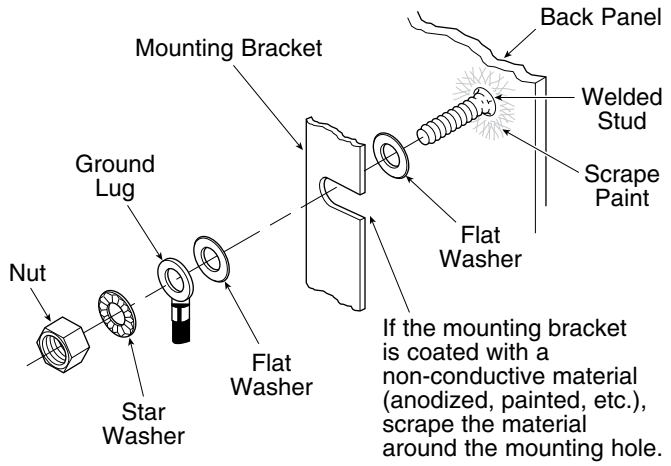
Figure 4 shows enclosure-wall ground connection details. Use a steel enclosure to guard against EMI. If the enclosure door has a viewing window, it should be a laminated screen or a conductive optical substrate to block EMI. Do not rely on the hinge for electrical contact between the door and the enclosure; install a bonding wire.

Figure 4 – Details of Ground Connection at Enclosure Wall



Connect an equipment grounding conductor directly from each chassis to an individual bolt on the ground bus. For a chassis with no ground stud, use a mounting bolt (Figure 5). For those chassis with a ground stud, use the ground stud for this connection (Figure 6).

Figure 5 – Details of Ground Connection at Mounting Bracket of Chassis with No Ground Stud



For a power supply without a groundable power supply chassis (such as a power-supply module or mini-processor with an integral power supply), or a power supply with a chassis that is not internally connected to its GND terminal, use a 14 AWG copper wire to connect its GND terminal to the ground stud or mounting bolt connected to the ground bus. This will ensure an adequate ground for noise immunity.

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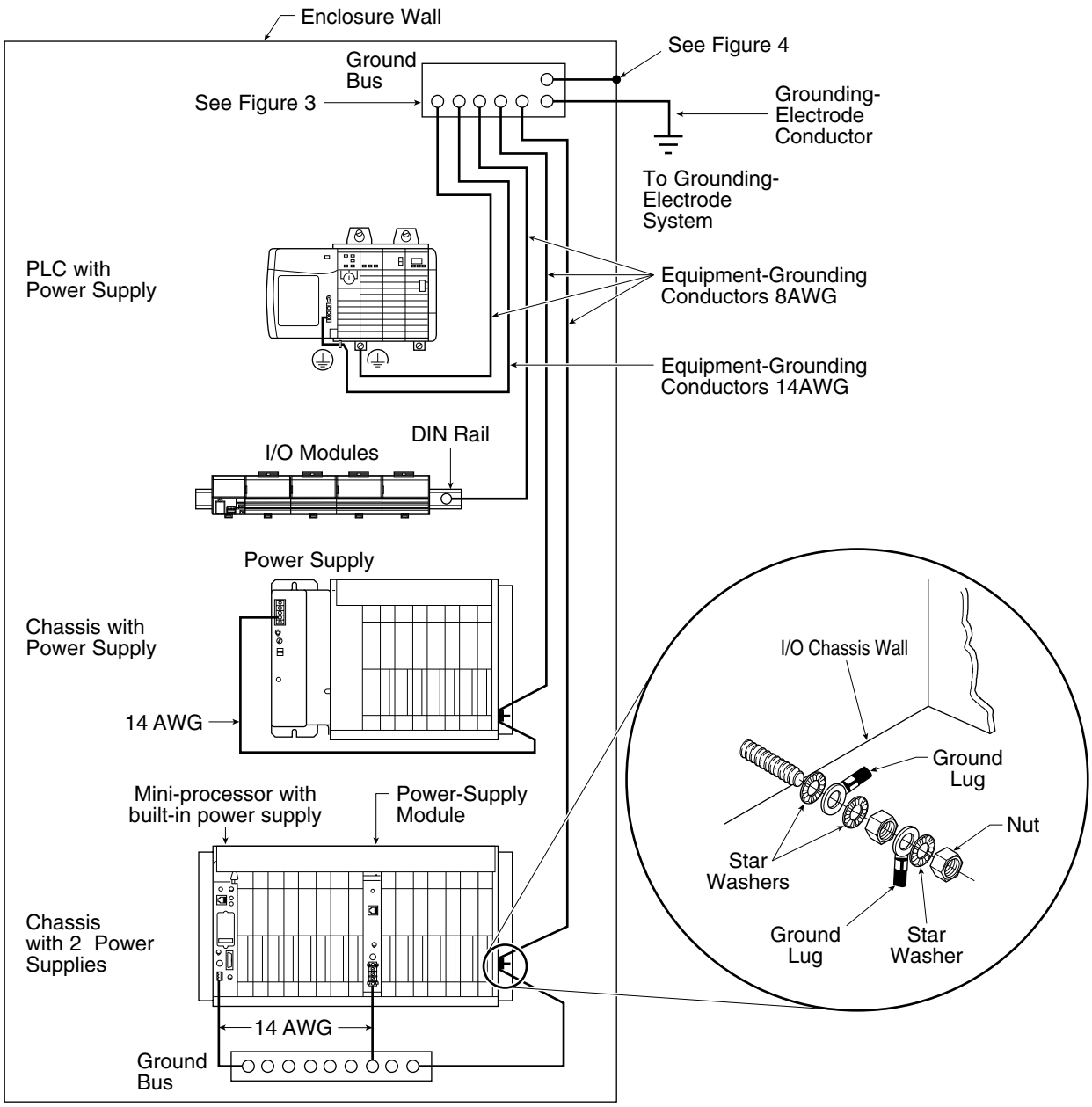
Figure 6 – Typical Grounding Configuration



Do not lay one ground lug directly on top of the other. This type of connection can become loose due to compression of the metal lugs. Sandwich the first lug between a star washer and a nut with a captive star washer. After tightening the nut, sandwich the second lug between the first nut and a second nut with a captive star washer.

Some products have no visible groundable chassis and no ground lug or ground terminal, but mount on a DIN rail. The chassis of these products are grounded only through the DIN rail. For these products, connect an equipment-grounding conductor directly from the mounting bolt on the DIN rail to an individual bolt on the ground bus.

Grounding-Electrode Conductor — Connect the ground bus to the grounding-electrode system through a grounding-electrode conductor. The grounding-electrode system is at earth-ground potential and is the central ground for all electrical equipment and AC power within any facility. Use 8 AWG copper wire minimum for the grounding-electrode conductor to help guard against EMI. The National Electrical Code specifies safety requirements for the grounding-electrode conductor.

Shielded Cables — Certain I/O connections require shielded cables to help reduce the effects of electrical noise coupling. Ground each shield at one end only. A shield grounded at both ends forms a ground loop which can cause a processor to fault.

Ground each shield at the end specified in the appropriate publication for the product. Never connect a shield to the common side of a logic circuit (this would introduce noise into the logic circuit). Connect each shield directly to a chassis ground.

For some communication network cables, the shield connections are unique to the particular cabling system. In some such cases, a DC short to ground is not needed because a low-impedance AC path to ground and a high-impedance DC path to ground are provided internally at each node. Follow the specific instructions in the publication provided for the specific communication network cabling system.

Avoid breaking shields at junction boxes. Many types of connectors for shielded conductors are available from various manufacturers. If you do break a shield at a junction box, do the following:

- Connect only category-2 conductors in the junction box.
- Do not strip the shield back any further than necessary to make a connection.
- Connect the shields of the two cable segments to ensure continuity along the entire length of the cable.

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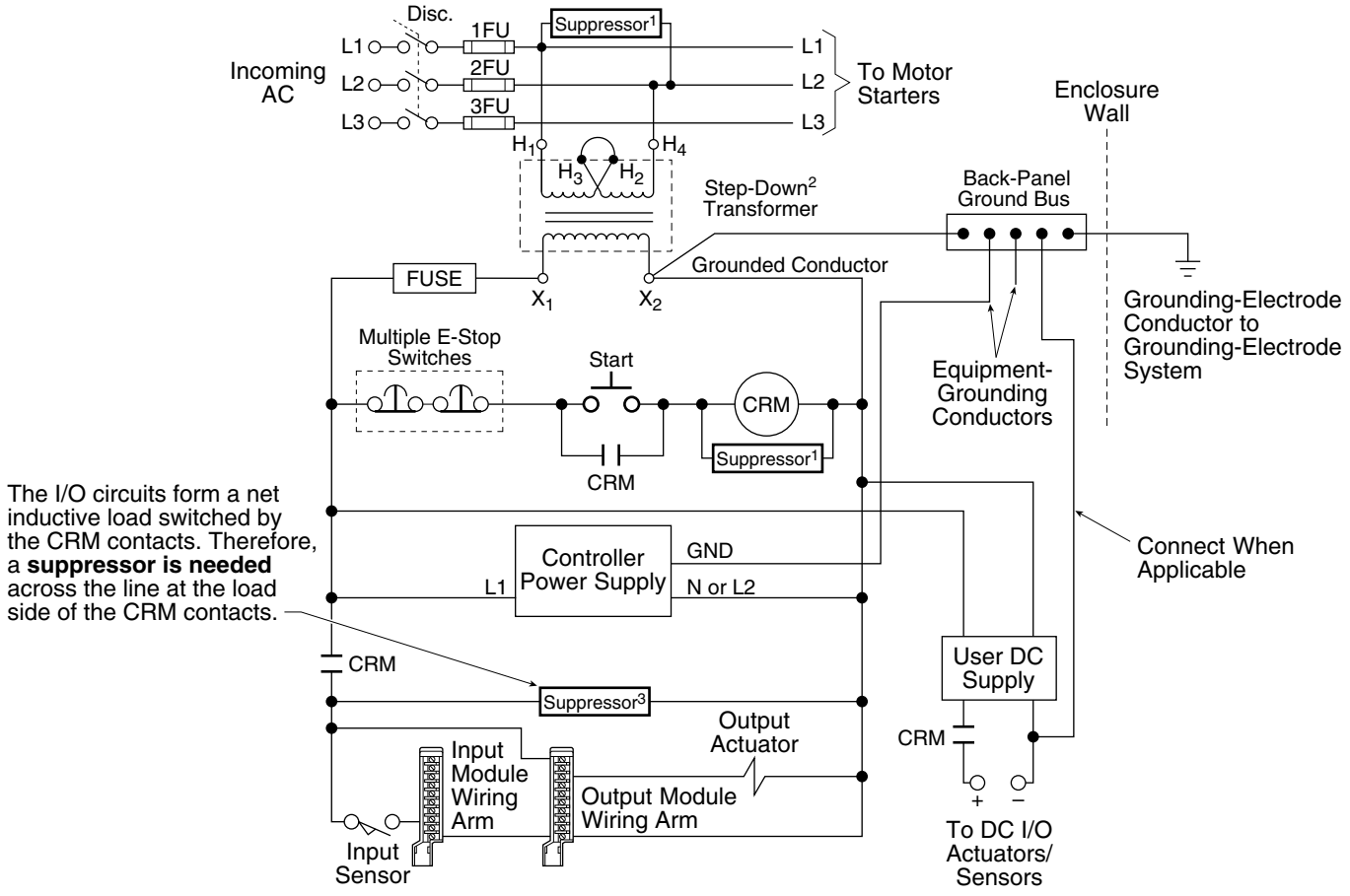
Power Distribution

You can connect the power supply directly to the secondary of a transformer (Figures 7 and 8). The transformer provides DC isolation from other equipment not connected to that transformer secondary. Connect the transformer primary to the AC source; connect the high side of the transformer secondary to the L1 terminal of the power supply; connect the low side of the transformer secondary to the neutral (common) terminal of the power supply.

Figure 7 – Grounded AC Power-Distribution System with Master-Control Relay



Notes:

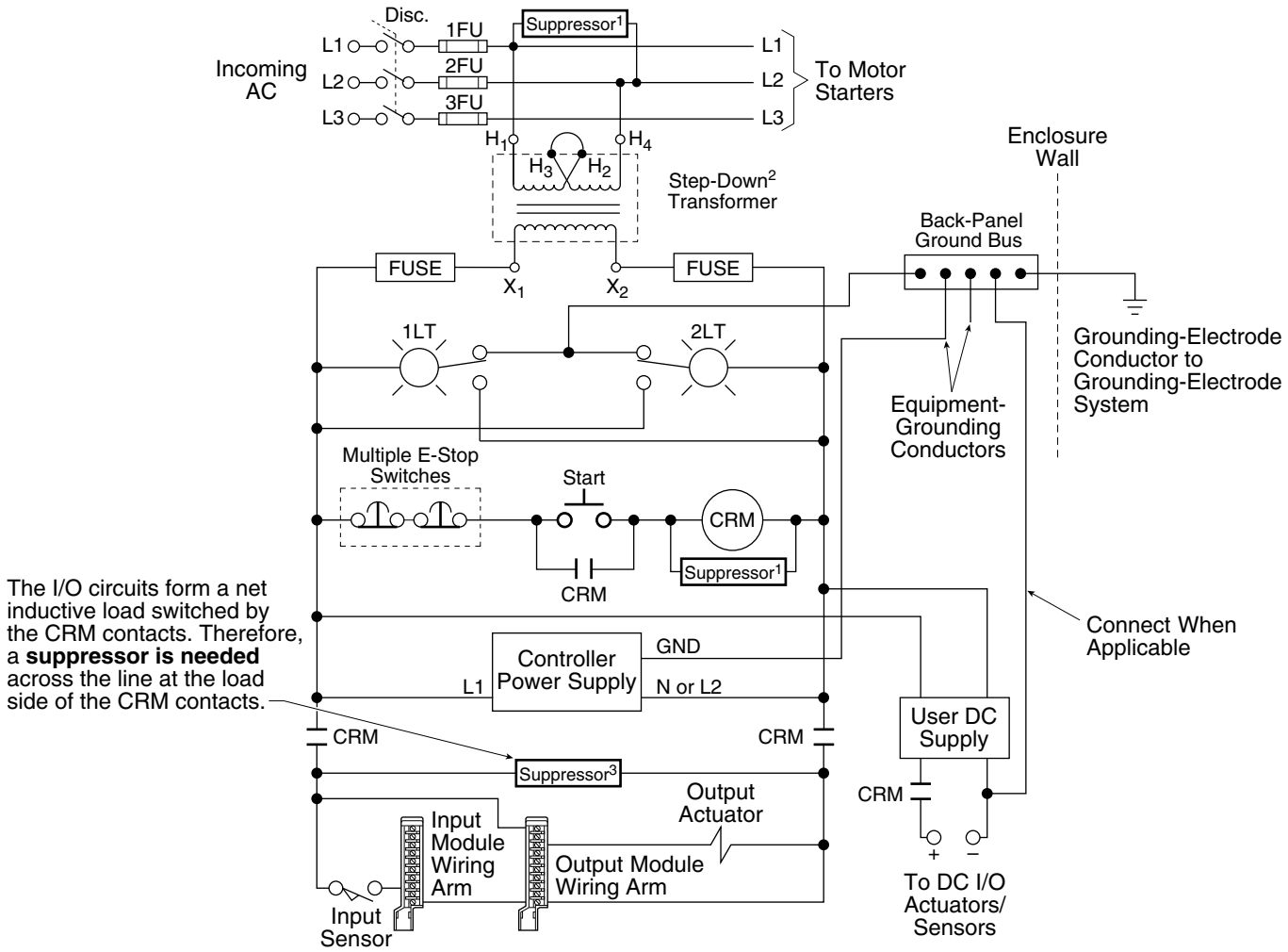
1 To minimize EMI generation, connect a suppressor across an inductive load.

2 In many applications, a second transformer provides power to the input circuits and power supplies for isolation from the output circuits.

3 Connect a suppressor here to minimize EMI generation from the net inductive load switched by the CRM contacts. In some installations, a 1µf 220Ω suppressor or 2µf 100Ω suppressor has been effective.

Connect one input directly to the L1 side of the line, on the load side of the CRM contacts, to detect whether the CRM contacts are closed. In the ladder logic, use this input to hold off all outputs anytime the CRM contacts are open. (Refer to your programming manual.) If you fail to do this, closing the CRM contacts could generate transient EMI because outputs are already turned on. To have outputs turned on when CRM contacts are closing would be analogous to squeezing the trigger on a hand tool as you're plugging it in.

Figure 8 – Ungrounded AC Power-Distribution System with Master-Control Relay



Notes:

1 To minimize EMI generation, connect a suppressor across an inductive load.

2 In many applications, a second transformer provides power to the input circuits and power supplies for isolation from the output circuits.

3 Connect a suppressor here to minimize EMI generation from the net inductive load switched by the CRM contacts. In some installations, a 1µf 220Ω suppressor or 2µf 100Ω suppressor has been effective.

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Common Power Source for I/O

Unless each I/O of a module or block is individually isolated, multiple I/O within the block or module share a common terminal for one side of the power source. All I/O sharing a common terminal must share a common power source (i.e., from the same pole of a disconnect or from the same transformer tap).

If a module or block has multiple commons, each common and its I/O may be isolated from the other commons. In that case, each common and its I/O can have a separate power source. If each I/O is individually isolated, each I/O can have a separate power source. If a module or block has individually isolated I/O or multiple isolated commons and multiple power sources are used, be certain that the difference in potential between any two power sources does not exceed the specified maximum continuous voltage that can be applied between the channels.

Under-Voltage Shutdown

Each power supply with under-voltage shut-down protection generates a shut-down signal on the backplane when the AC line voltage drops below its lower voltage limit. The power supply removes the shut-down signal when the line voltage comes back above the lower voltage limit. This shut-down is to guard against invalid data being stored in memory.

Because a capacitive-input power supply converting AC to DC draws power only from the peak of the AC voltage wave-form, the external transformer load (in VA) of each power supply is 2.5 times its real power dissipation (in Watts). If the transformer is too small, the peaks of the sine wave are clipped. Even if the voltage is still above the lower voltage limit, the power supply senses the clipped wave as low voltage and sends the shut-down signal.

Sizing the Transformer

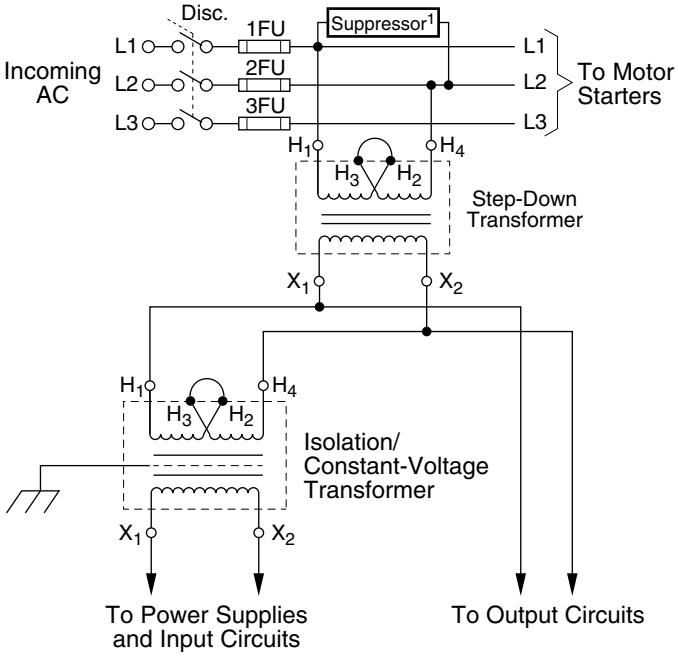
To determine the required rating of the transformer add the external-transformer load of the power supply and all other power requirements (input circuits, output circuits). The power requirements must take into consideration the surge currents of devices controlled by the processor. Choose a transformer with the closest standard transformer rating above the calculated requirements.

For example, the external-transformer load of a power-supply module at maximum backplane load current is 140VA (2.5 x 56W = 140). A 140VA transformer could be used if a power-supply module were the only load. A 500VA transformer should be used if there were 360VA of load in addition to that of the power-supply module.

Second Transformer

Certain manufacturer's power supplies have circuits that suppress electromagnetic interference from other equipment. However, isolate output circuits from power supplies and input circuits to help prevent output transients from being induced into inputs and power supplies. In many applications, power is provided to the input circuits and power supplies through a second transformer (Figure 9).

Figure 9 – Power Supplies and Input Circuits Receiving Power Through a Separate Transformer



Notes:

1 To minimize transient EMI generation when power is interrupted by the interrupt switch, connect a suppressor across the primary of the transformer.

Isolation Transformer — For applications near excessive electrical noise generators, an isolation transformer (for the second transformer) provides further suppression of electromagnetic interference from other equipment. The output actuators being controlled should draw power from the same AC source as the isolation transformer, but not from the secondary of the isolation transformer (Figure 9).

Constant-Voltage Transformer — In applications where the AC power source is especially "soft" and subject to unusual variations, a constant-voltage transformer can stabilize the AC power source to the processor and minimize shutdowns. The constant-voltage transformer must be of the harmonic neutralizing type.

If the power supply receives its AC power through a constant-voltage transformer, the input sensors connected to the I/O chassis should also receive their AC power from the same constant-voltage transformer. If the inputs receive their AC power through another transformer, the AC source voltage could go low enough that erroneous input data enters memory while the constant-voltage transformer prevents the power supply from shutting down the processor. The output actuators being controlled should draw power form the same AC sources as the constant-voltage transformer, but not from the secondary of the constant-voltage transformer (9).

Ground Connection

When AC power is supplied as a separately derived system through an isolation/step-down transformer, you can connect it as a grounded AC system or an ungrounded AC system. For a grounded AC system, connect one side of the transformer secondary to the ground bus as in Figure 7. For an ungrounded AC system, connect one side of each test switch for the ground-fault-detector lights to the ground bus as in Figure 8. We do not recommend an ungrounded system. Follow local codes in determining whether to use a grounded system.

When bringing AC power into the enclosure, do not ground its raceway to the ground bus on the back-panel. Connecting the raceway to the ground bus may cause the processor to fault by introducing EMI into the grounding circuit. Local codes may provide an exception for permitting isolation from the raceway. For example, article 250-75 of the National Electrical Code has an exception that explains the conditions under which this isolation from the raceway is permitted.

Surge-Suppression

Transient EMI can be generated whenever inductive loads such as relays, solenoids, motor starters, or motors are operated by "hard contacts" such as pushbutton or selector switches. The wiring guidelines are based on the assumption that you guard your system against the effects of transient EMI by using surge-suppressors to suppress transient EMI at its source. Inductive loads switched by solid-state output devices alone do not require surge-suppression. However, inductive loads of AC output modules that are in series or parallel with hard contacts require surge-suppression to protect the module output circuits as well as to suppress transient EMI.

Figure 10 shows three Examples of where to use suppressors. In Example 1, although the motor-starter coil is an inductive load, it does not need a suppressor because it is switched by a solid-state device alone. In Example 2, the relay coil needs a suppressor because a hard-contact switch is in series with the solid-state switch. However, in both Examples 1 and 2, we show a suppressor on the motor and solenoid because it is an inductive load switched by the hard contacts of the motor starter or relay. **Even if they have no interaction with the control system, regularly cycled loads of this type need suppression if conductors connecting to these loads are: 1) connected to the same separately derived system as that of the control system; 2) or routed in proximity with conductors of the control system as per the routing guidelines.**

In Example 3, the pilot light has a built-in step-down transformer that needs a suppressor because it is an inductive load being switched by the hard contacts of a contact output module; without suppression, the transient EMI would be generated inside the I/O chassis. Lights with built-in step-down transformers that are switched by hard contacts external to any I/O chassis may not need to be suppressed because the noise spike they can generate may be only approximately one tenth that of a relay or motor starter.

In all cases, the AC power coming into the I/O modules must be switched by the CRM contacts. Therefore, a suppressor is needed across the line at the load side of the CRM contacts as shown in Figures 7 and 8. The application (voltage, net load of I/O circuits) dictates the specific suppressor needed across the line at the load side of the CRM contacts.

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Figure 10 – Examples of Where to Use Suppression

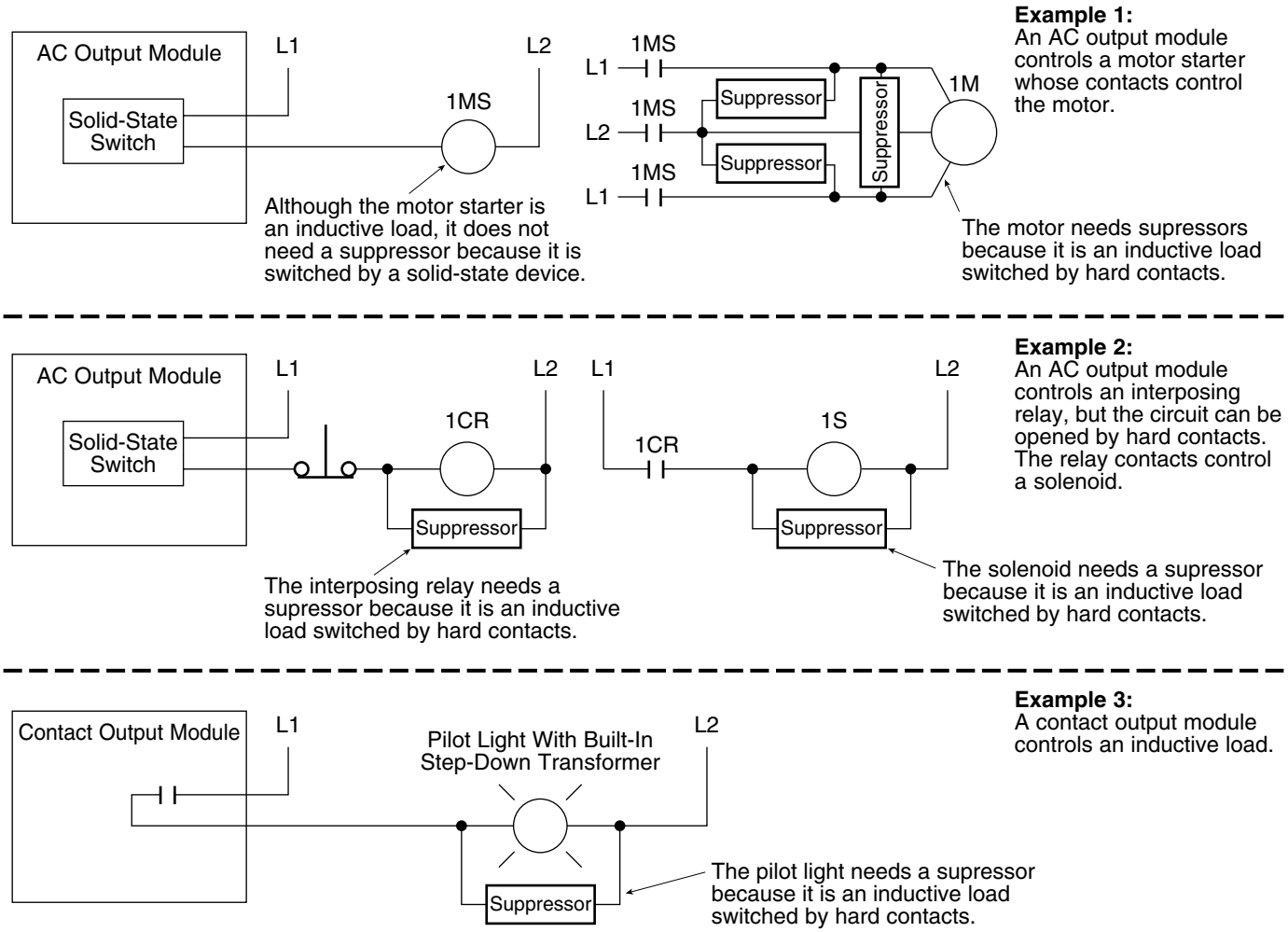
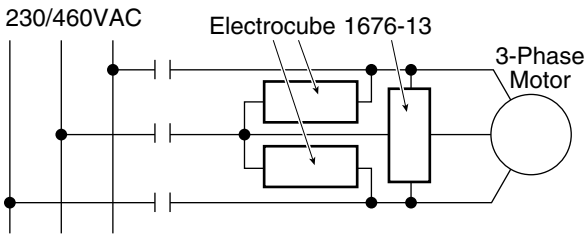
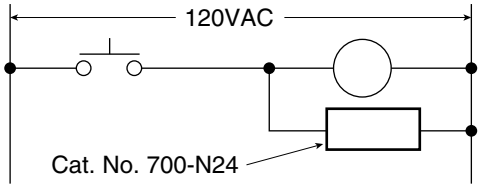

AC Output Module
Solid-State Switch
L1
L2
1MS
Although the motor starter is an inductive load, it does not need a suppressor because it is switched by a solid-state device.
1MS
L1
1MS
L2
1MS
L1
Suppressor
Suppressor
Suppressor
1M
The motor needs supressors because it is an inductive load switched by hard contacts.
Example 1:
An AC output module controls a motor starter whose contacts control the motor.
AC Output Module
Solid-State Switch
L1
L2
1CR
Suppressor
The interposing relay needs a supressor because it is an inductive load switched by hard contacts.
L1
L2
1CR
1S
Suppressor
The solenoid needs a supressor because it is an inductive load switched by hard contacts.
Example 2:
An AC output module controls an interposing relay, but the circuit can be opened by hard contacts. The relay contacts control a solenoid.
Contact Output Module
L1
Pilot Light With Built-In Step-Down Transformer
L2
Suppressor
The pilot light needs a supressor because it is an inductive load switched by hard contacts.
Example 3:
A contact output module controls an inductive load.

Figure 11 shows typical suppression circuitry for different types of loads.

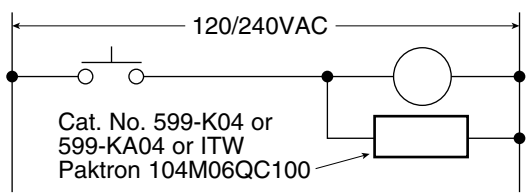
Figure 11 – Typical Suppression Applications



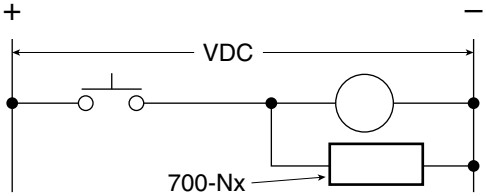
For 3-Phase Apparatus, a Suppressor is Needed Across Each Phase



For Small Apparatus (Relays, Solenoids, and Motor Starters up to Size 1)



For Large Apparatus (Contacts up to Size 5)



For DC Relays

Surge-suppressors are usually most effective when connected at the inductive loads. They are still usable when connected at the switching devices; however, this may be less effective because the wires connecting the switching devices to the inductive loads act as antennas that radiate EMI. You can see the effectiveness of a particular suppressor by using an oscilloscope to observe the voltage waveform on the line.

Ferrite Beads

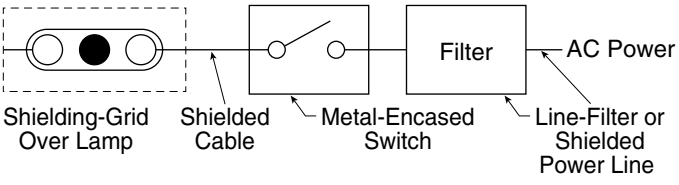
Ferrite beads can provide additional suppression of transient EMI. Fair-Rite Products Corporation manufactures a ferrite bead (part number 2643626502) which can be slipped over category-2 and -3 conductors. You can secure them with heat-shrink tubing or tie-wraps. With a ferrite bead located near the end of a cable (or cable segment in the case of a daisy-chain or dropline configuration) transient EMI induced onto the cable can be suppressed by the bead before it enters the equipment connected to the end of the cable.

Enclosure Lighting

Fluorescent lamps are also sources of EMI. If you must use fluorescent lamps inside an enclosure, the following precautions may help guard against EMI problems from this source as shown in Figure 12:

- Install a shielding grid over the lamp
- Use shielded cable between the lamp and its switch
- Use a metal-encased switch
- Install a filter between the switch and the power line, or shield the power-line cable

Figure 12 – Installation Requirements for Suppressing Noise From Fluorescent Lamps Inside an Enclosure



Avoiding Unintentional Momentary Turn-On of Outputs

Unintentional turn-on of outputs as the power source is connected or disconnected, even if momentary, can result in injury to personnel as well as damage to equipment. The danger is greater with fast-response actuators. You can help minimize the probability of unintentional momentary turn-on of AC and DC circuits by following each of these guidelines according to your specific application:

- Follow the surge-suppression guidelines in this publication
- Follow the bonding and grounding guidelines in this publication
- Do not unnecessarily disconnect the power source from output circuits
- Where possible, turn off all outputs before using CRM contacts to interrupt the output circuit power source
- Hold off all outputs anytime the CRM contacts are open to be certain that they are off as power is reconnected

Even if unintentional momentary turn-on does occur, the effects can be minimized if:

- Actuators have a home position, i.e. defined by a spring return
- For latching actuators, in the ladder logic, use non-retentive energize (OTE) instructions with hold-in (seal-in) paths to maintain the established position until power turn-off and leave outputs off initially at power turn-on
- Each input or other load device connected to an output has an input-filter time constant no lower than necessary for the application

After designing and installing your system following these guidelines to minimize unintentional momentary turn-on and any effects thereof, test the system by de-energizing and then re-energizing the CRM relay (Figures 7 and 8).

Related Publications

For additional information regarding wiring and grounding guidelines, refer to:

- Application Considerations for Solid-State Controls (publication A10325) — this is an aid to the user of solid-state controls who has considerable familiarity with relay-type controls but may have limited electronic experience and knowledge.

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- National Electrical Code (ANSI/NFPA 70) — Article 250 of this code provides information about the types and sizes of conductors and methods for safely grounding electrical equipment and components. Articles 725-5, 725-15, 725-52, and 800-52 restrict the placement of different types of conductors in a composite cable, a raceway, or a cable tray.
- IEEE Recommended Practice for Grounding of Industrial and Commercial Power Systems (IEEE Std 142-1991)
- Grounding for the Control of EMI (by Hugh W. Denny — publisher, Don White Consultants Inc., 1973)
- Electromagnetic Interference and Compatibility, Volume 3 (by R. J. White — publisher, Don White Consultants, Inc., 1981)
- Military Handbook 419, “Grounding, Bonding, and Shielding for Electronic Equipment and Facilities”
- IEEE Guide for the Installation of Electrical Equipment to Minimize Electrical Noise Inputs to Controllers from External Sources (IEEE Std 518-1982)
- IEEE Recommended Practice for Powering and Grounding Sensitive Electronic Equipment (IEEE Std 1100-1992)

NOTES

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